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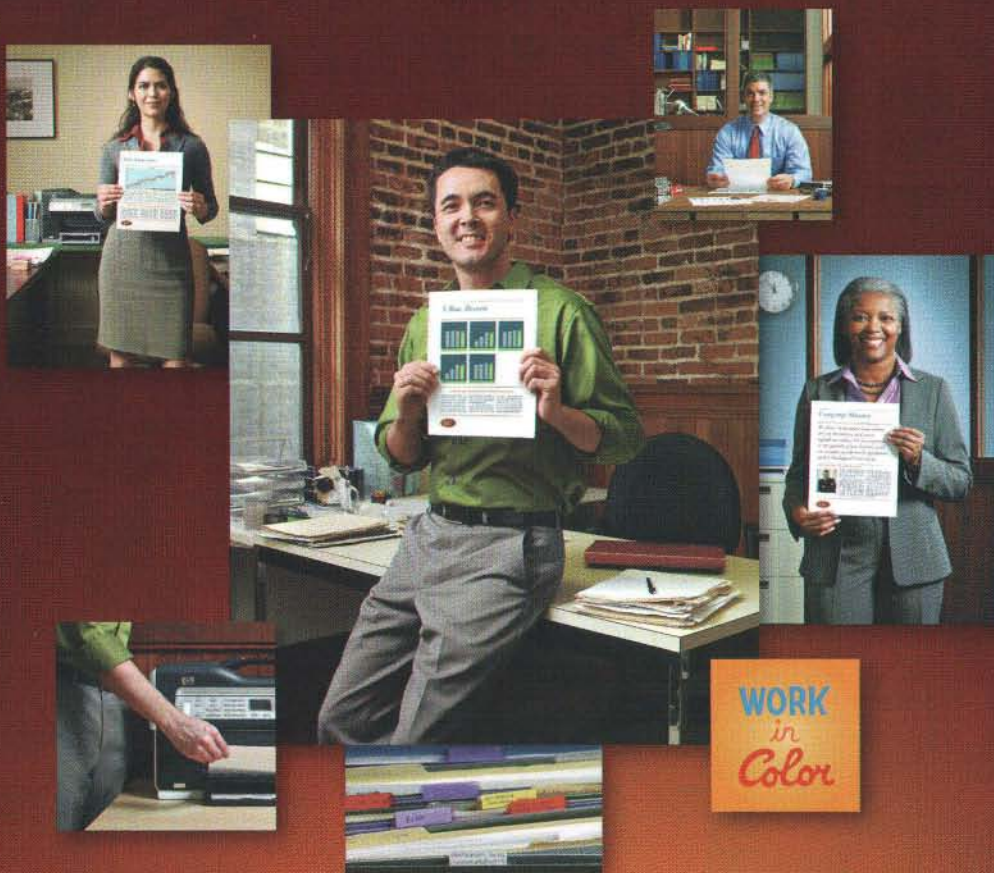
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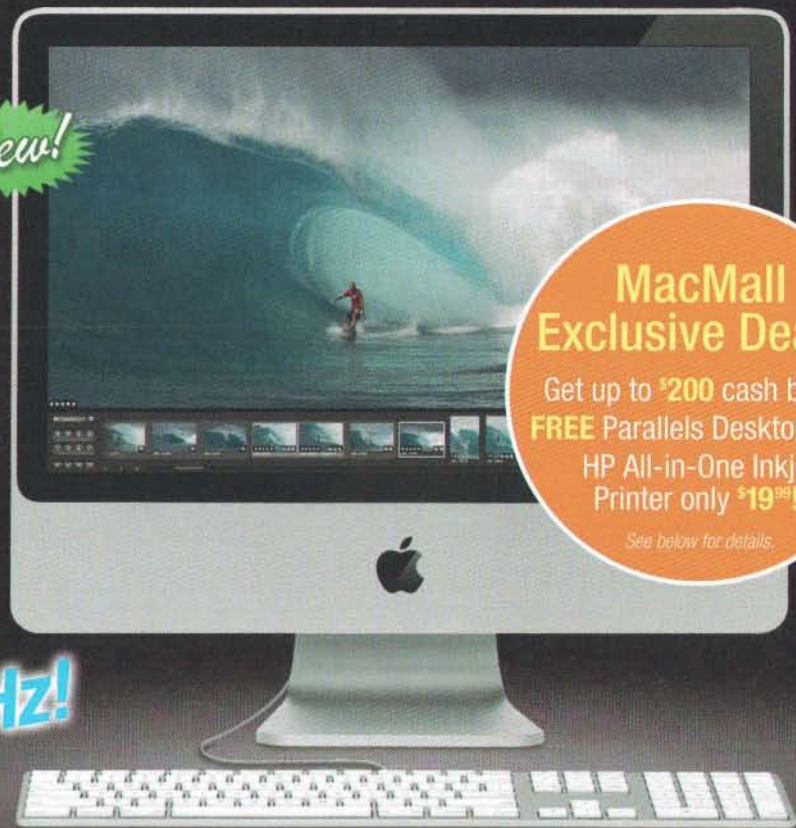
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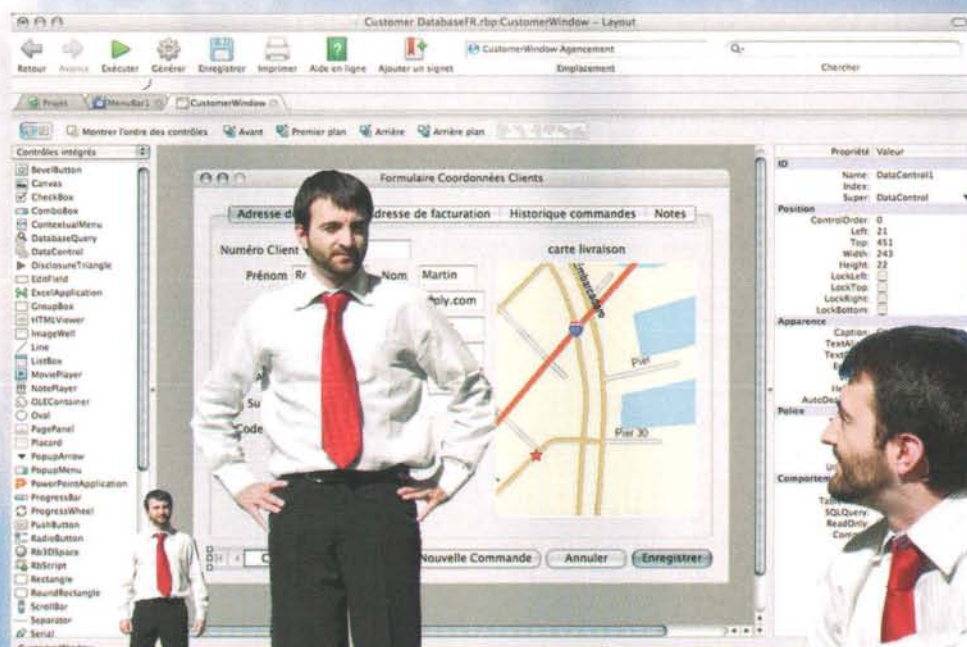
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From the Editor

Welcome to MacTech's first issue since WWDC 2008, where we can report on...nothing! That's right, WWDC promised us a new release of Mac OS X with no new features! Of course, that's far from true: there's plenty in the Snow Leopard release debuted at WWDC. Unfortunately, all of the *really* juicy stuff was presented outside of the keynote and is under NDA. The keynote was all about the iPhone, the hardware and the upcoming software SDK. Both of which will be released by the time you get this in print. Interestingly, the new hardware hasn't necessarily prompted pure lust for the latest and abandonment of the original model. Many people are simply going to hang on to their rev. 1 device. Others I know are going to sell it off – sometimes at a profit! Finally, many iPhone devs I know are going to buy a 3G unit, but keep their rev. 1 model for, you guessed it, development.

What about Mac OS X? Enough of the details *are* publically available on Apple's Snow Leopard page (<http://www.apple.com/macosx/snowleopard/>). Apple's Open Computing Language (OpenCL) will be a huge boon to anyone writing computationally intensive software. OpenCL allows a developer to *easily* take advantage of the computing power available on the GPU (Graphics Processing Unit) of the video card, or cards, available in each machine. GPUs are tuned for different types of computations than CPUs, but make no mistake: when running an optimized computation, they are thousands of times faster than a CPU. Modern CPUs are good at branching – code that needs to make decisions. GPUs are good at taking a block of code and running straight ahead with it. Combine the two, and there's a powerful platform. I'm looking forward to seeing a mini-Cray by topping out a MacPro with RAM and GPUs. I'm also looking forward to Apple outright owning scientific computing thanks to this development.

Also of interest is QuickTime X. Think about this for a minute: QuickTime was rewritten for the iPhone. Now, that version is being ported to desktop OS X. That's pretty awesome. QuickTime X is being touted as being light and fast. It's a ground up rewrite, so, I'm sure it is. More importantly, *it's a ground up rewrite*. Unfortunately, QuickTime has been a source of security issues for Apple and OS X. It's Apple's Internet Explorer. QuickTime is an old framework at this point, and a rewrite makes a lot of sense. There's likely tons of code that can just go away.

Finally, WebKit has been swirling around my head lately. *A lot*. When Apple first announced its use of KHTML and the creation of WebKit, I thought, "oh, nice. Good for Apple – they'll have one more piece of the puzzle." I did not think that the adoption of WebKit would be what it is now. Naturally, developers on Mac OS X can incorporate the use of WebKit into their own applications (like Entourage 2008 does). Safari (WebKit) runs on Windows now, too. Don't forget, though, that WebKit is open source. A new browser named Opus Palladianum, designed for security (<http://www.tech.com/securebrowser.html>) will be leveraging WebKit. Google's Android smart phone OS is using WebKit (<http://webkit.org/blog/142/android-uses-webkit/>). Yahoo's Messenger renders IM conversations using WebKit. Even text editors like BBEdit and TextMate rely on WebKit somewhere. The list goes on at length. You should be reading the Surfin Safari blog (<http://webkit.org/blog>), using the nightly builds (<http://nightly.webkit.org>), and reporting bugs.

This month's content revolves around backup, and I'm thrilled to have long time Mac author Joe Kissell guide us through an important topic: creating a backup policy. More often than not, backup systems and schedules are chosen without truly defining the assets being protected and matching system needs to that of the organization being protected. Henri Stushak writes about Lbackup, open source backup program. Lastly on the backup front, I review two Take Control titles that serve two different beginning audiences implementing backup.

In addition to the other great content this month, please check out the MacTech Spotlight featuring Andy Lee. Andy is a "part-time" Cocoa developer. He's also the author of AppKiDo, an application that other developers love. It goes to show how you can get involved in OS X development and have an impact no matter if it's your day job or not. How are *you* getting involved?

Ed Marczak,
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Major Releases, Benchmarks, and Feedback

Benchmarks and how the community contributes

By Neil Ticktin, Editor-in-Chief/Publisher

Complexities

Software is a complex beast these days, and it has been for a while. Just take a look at the storage on your local machine, and you will likely see hundreds of thousands of files and folders, if not a million or more.

OS X, like other OSes, has many different configurations – more than is realistically possible for anyone to test on even for the biggest of companies. As a result, developers have gone into the mode of trying to write the best quality software that they can, do realistic testing, and then focus enormous efforts on listening for problems, and reacting to them. Both Microsoft and Apple are great examples of having done this on the Mac.

But with this approach comes a lot of responsibility on the community, especially those that are technical in the market. As a MacTech reader you are at the core of this market). Like it or not, this responsibility lands largely on your shoulders.

Leopard and Microsoft Office 2008 are both giving us good examples of what to look for, what to expect, and what our responsibilities are.

Benchmarks

MacTech strives to give you quality benchmarks. We've done it for virtualization environments, Rosetta, hard drives, and Microsoft Office. In all of these cases, like anyone else that does high end testing, we do this in "virgin" or "clean" environments. It's the only way to do the testing, as you cannot penalize a product by putting it on a machine that needs to have a disk utility run on it, or has system problems, or a congested network.

Benchmarks are a great tool — they allow you to see, in an "apples to apples" comparison, how well a product performs. As the pros in the industry, you take those benchmarks and start to apply them to your real world setting, as only you know the setups you have. When major releases come out, the distance between a clean

setup and yours may be that much more important, and here, your involvement grows.

Let's take Leopard and Microsoft Office 2008 as examples. Both of these are herculean efforts on behalf of their developers, and are massive releases. As anyone experienced will tell you, releases of this size are never perfect. There's no way for the developer to test all permutations of hardware, OS release and other software installed on the machine.

Community Feedback

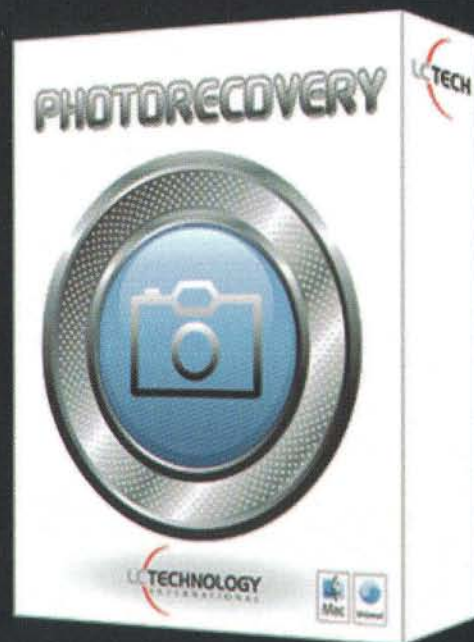
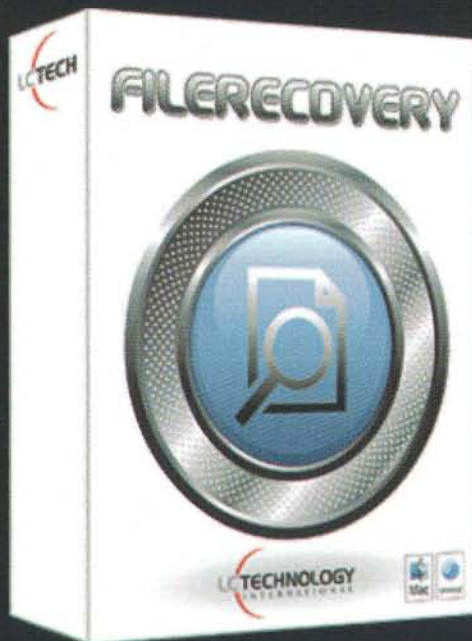
So, what's a geek to do? Well, that's a good question. When major new releases come out, you should get a copy in your hands as fast as possible, and start to use it yourself. What you should not do is put yourself in a situation where you are supporting others using it, and furthermore, you should not yourself be in a position where you are dependent on it working.

As you are able to experiment with these new versions, you want to understand what, if any, pitfalls you fall into. You should be looking for bugs, incompatibilities and more.

**Now here's the important part ...
you need to report them.**

This is so much more important today than it was in the past. As the technical community, it's become our responsibility to report the problems so that they can be fixed. If we don't report them, they are not likely to be fixed. Gripping about issues on public mailing lists and in blogs doesn't count. Even more important, the bug tracking and reporting tools have become sophisticated enough that they not only provide information on what you are experiencing, but give statistical information to help rank the importance of the problems within the community.

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Apple and Mac OS X / Mac OS X Server

As many in the industry will tell you, Apple versions tend to stabilize on the .3 version. For example: Leopard will likely stabilize quite a bit on 10.5.3. It just takes that many interactions of versions and general usage to get the major kinks worked out. That's not to say that there won't be bugs with a .3 version; Historically, the .3 version is the one that generally runs well, and then has incremental improvements from there.

Every time you have an application that unexpectedly quits, a dialog appears asking for permission to send information to Apple. You should use this as much as you can, as it's not only fast, but it gives very specific machine generated information that is very helpful to Apple in understanding the situation that just happened.

In looking through Apple's online support, you'll see a way to give Apple feedback on whether an answer was helpful to you or not. Take the few seconds to let them know if it was helpful or not — over time, it makes a difference.

If you are looking for help on an issue, there are a couple of things that you can do. First, you can use MacTech's "Community Search Engine." Here, we've selected the best web sites in the community, including Apple's support sections, to be a part of the search. So, when you are looking for "rebuild degraded RAID," you'll get only those search results relevant to

the Mac and OS X, and not the hundreds of thousands of answers you might see with a general Google search. See the left navigation bar on MacTech.com or <http://www.mactech.com/advancedsearch.html> — either way don't forget to press the "Mac Community" radio button for that type of search.

Apple uses their "Bug Reporter" system at <http://bugreporter.apple.com/> as the primary way to report bugs to Apple. ADC Membership (free registration) is required to use this tool. And, there's a great article on AFP548.com that talks about the best ways to use Apple's system — see <http://www.afp548.com/article.php?story=20051102133234150>

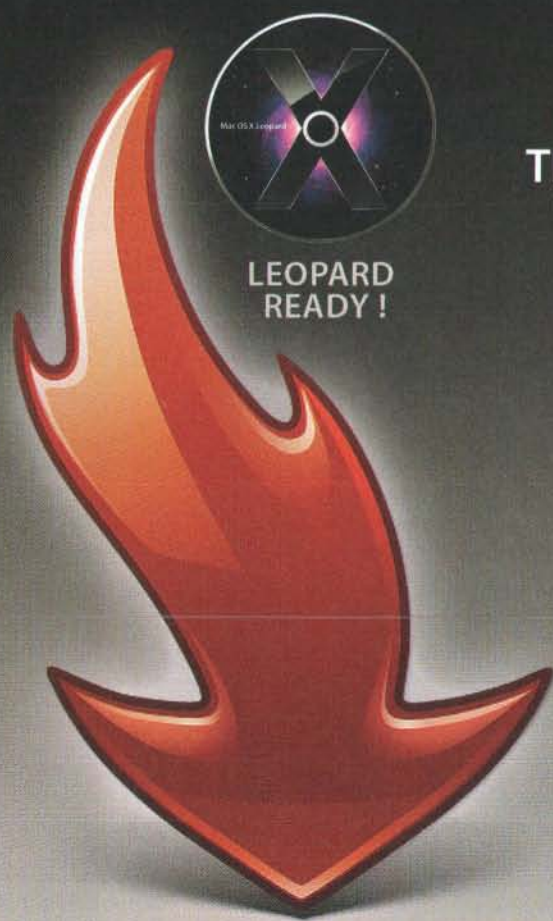
Microsoft Office

Microsoft also uses a variety of ways to have people report in information. In fact, they appear to have broader methods of interacting than Apple does.

Microsoft has a "Send Feedback" command in the Help menu that redirects users to a page on the Mactopia web site. This information is generally used to plan future products for Microsoft.

See <http://www.microsoft.com/mac/suggestions.mspx>

Like Apple, the online Help sections on the Microsoft web site also asks, "Was this helpful?" Clicking the "No" or "Somewhat" buttons prompts for slightly more detail. When the community tells them why a topic isn't helpful, they can use



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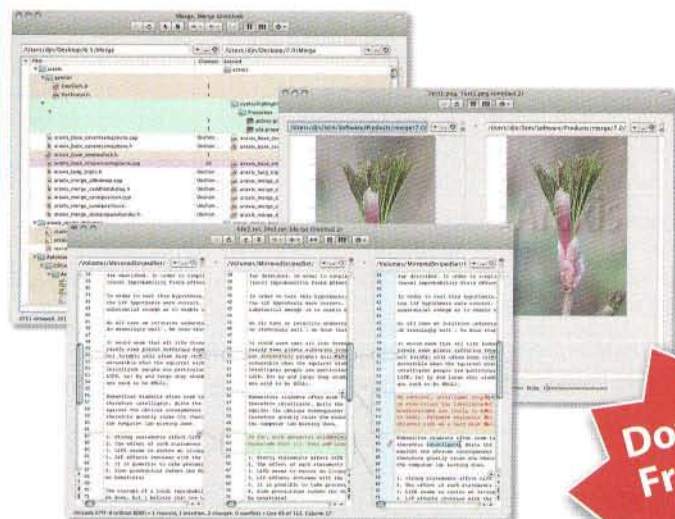
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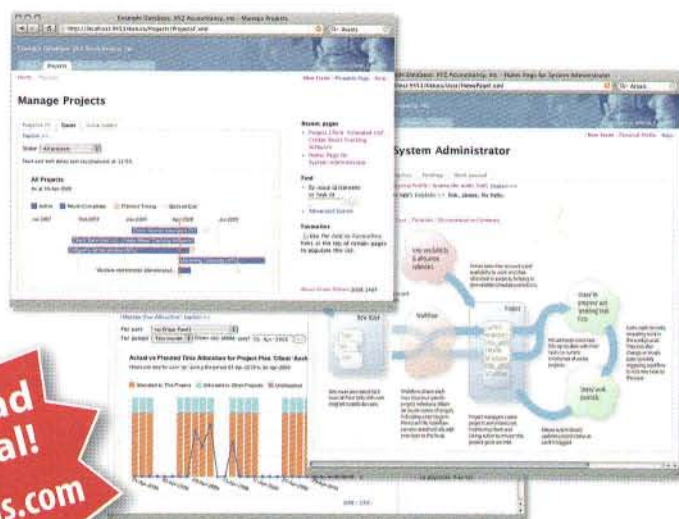
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that feedback to change the topic online, without having to wait for the next major release for offline content updates. Microsoft calls this "continuous publishing."

If you are looking for help on any of the Microsoft Office products, you should look to the newsgroup forums. Here, there are MVPs (not Microsoft employees) that know the products in depth, and will give you very candid answers. They are particularly good at answering "how to" questions. In addition, Microsoft read the posts looking for problem reports, and if appropriate will compare them to reported issues, or create a new one. Here are the URLs for the web interface into the newsgroup forums:

<http://www.officeformac.com/ProductForums/Word/>

<http://www.officeformac.com/ProductForums/Excel/>

<http://www.officeformac.com/ProductForums/PowerPoint/>

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When you first install Office, it asks if you want to be part of the Customer Experience Improvement Program (aka CEIP) which gives Office permission to periodically send statistical data back to Microsoft about how the products are used. No personal information is collected. This is very helpful to Microsoft, if you are game. (The default is off, so you would need to turn it on.)

Finally, Microsoft uses Microsoft Error Reporting (MERP on the Mac, and Watson for Windows), which is for real time error

reporting. Like Apple's reporter for Mac OS X, this is an excellent way to quickly send information that is machine generated about the problem that you are experiencing.

Statistical Benefits

What all the larger organizations have in their error reporting is the ability to gather significance statistically from the error reports. For example, there are patterns to problems, and the bug reports are done in a way that Microsoft (and presumably Apple), can compare two bug reports and see if they are the same issue or not. Once that happens, they can determine whether an issue has widespread impact, or is localized to just a few users. In other words, it helps them to prioritize which things need to be fixed first.

Another example is that they can see that certain problems may be on specific OS versions, categories of machines, or even specific models of machines. This not only helps in understanding how to fix the bug, but is also may give insight that it's not a vendors bug.

For example, in the next maintenance release of Leopard, Apple is rumored to be fixing a large number of items. Microsoft may be looking at bug reports for an issue, and may very well find that the problem in question is not one with Office, but with the Operating System instead. Of course, the same thing could happen in the opposite direction where Apple receives bug reports, and finds that it's a third party.

Near Term Expectations

Leopard's next update will likely be the one that fixes so much stuff that those that have been waiting, should now move forward. Naturally, Microsoft is working on updates for Office 2008 as well, presumably called SP1 (Service Pack 1, if they hold true to naming conventions). These will likely to fix many issues that widespread distribution saw, but MacTech may not have with the benchmarks on clean machines.

Why is this expected? Because both these companies have mechanisms in place to listen to customer experiences, problems, and bugs, research them down through statistical and other comparisons, and rank their priority accordingly.

But, all of that doesn't work unless we, the technical community, make sure to use the reporting mechanisms as much as possible.

MM

About The Author

Neil is the Editor-in-Chief and Publisher of MacTech Magazine. Neil has been in the Mac industry since 1985, has developed software, written documentation, been heading up the magazine since 1992. When Neil writes a review, he likes to put solutions into a real-life scenario and then write about that experience from the user point of view. That said, Neil has a reputation around the office for pushing software to its limits and crashing software/finding bugs. Drop him a line at publisher@mactech.com

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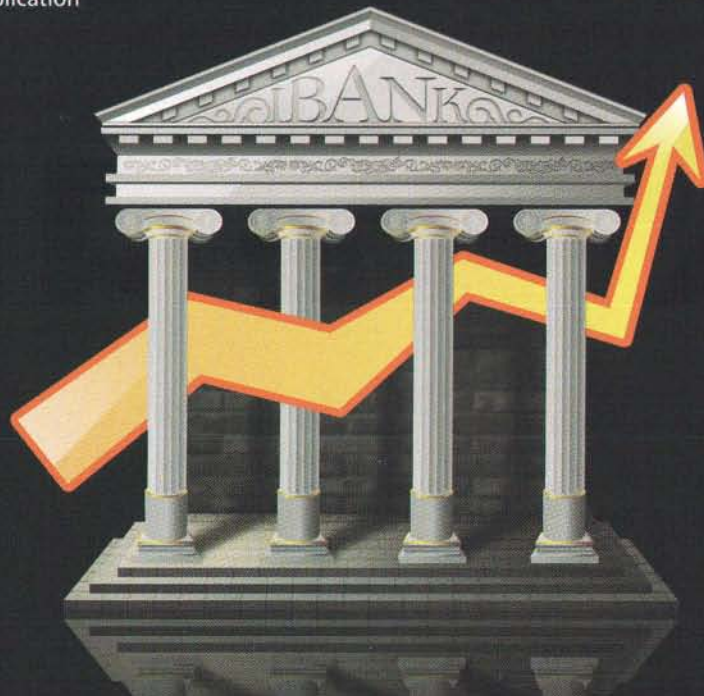
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Creating Widgets with Dashcode

When to use Dashcode, and other important widget information

by Mihalis Tsoukalos

Introduction

This article is going to introduce you to Dashcode, an application –actually, an IDE– for creating and debugging Dashboard Widgets. You will also learn other essential information about installing and packaging Widgets, the Info.plist file and its keys as well as the Property List Editor.

What is Dashcode?

Dashcode is a development environment, a GUI application, for creating Widgets. Although it was exposed prior to its official release, we now know it is a reality. With the release of Mac OS X 10.5 and Xcode 3, Dashcode was officially released to end users.

You should use the Xcode Tools installer to install Dashcode. After installation, you will find Dashcode in `/Developer/Applications/`.

Figure 1 shows the About Dashcode window information of both the unofficial–this beta expired on July 15th, 2007–and official versions. Both versions are numbered as 1.0!

When to use Dashcode

- Dashcode is a great tool but it cannot solve every problem efficiently. Knowing its strengths and weaknesses will help you use it effectively. You can also judge when, and when not to use it.
- Dashcode is wonderful for automatically creating template files that you can edit, as you wish, when creating your own Dashboard Widgets. This is a great time saver!
- Dashcode is perfect for debugging Widgets because it allows you to dynamically view your errors. Another great time saver when troubleshooting Dashboard Widgets!

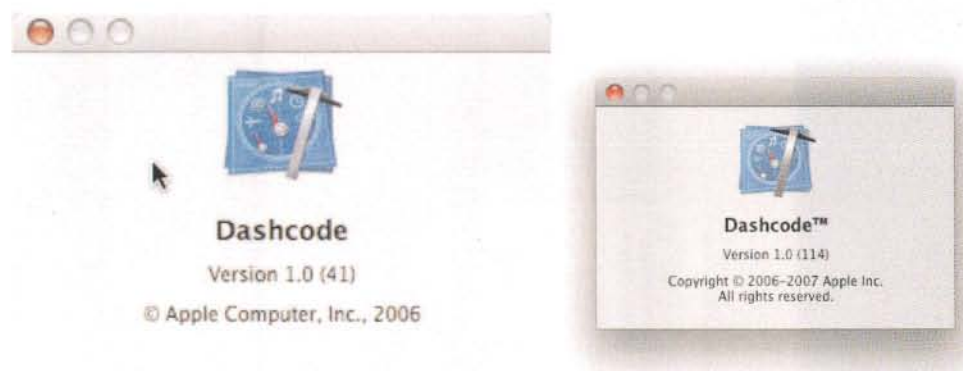


Figure 1: The “About Dashcode” information window of the unofficial and official Dashcode versions

- Dashcode is useful for quickly creating Info.plist files.
- Dashcode is very efficient when creating Widget with localization.

When not to use Dashcode

I'll first admit a little bias: I personally do not, for the most part, like integrated programming environments, as I prefer to write my own code using my editor of choice. Although Dashcode came into action while I was writing my eBook, I was very happy that I wrote most of the book's code using an editor without using code that was automatically created by a tool. I dislike the fact that most programming environments style code as they prefer, where they prefer and, sometimes, without letting the programmer decide essential details.

My advice is that when you are learning a new programming paradigm or technique, it is generally better to first write all your code by hand, and, as you become more experienced, to use such a tool. Through experience, you can differentiate good code from bad code, debug your code and make changes to the created code.



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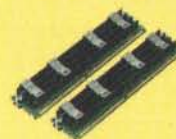
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RAM Configuration	Stock 2.0GB 2048MB (2x 1024)	OWC Powered 4.0GB 4096MB (2x 2048)
MacBook® Pro 15" (Mid/Late 2007) 2.2 GHz Core™ 2 Duo (4MB L2 Cache)	122.37 seconds	Only 85.15 seconds! 30% faster
MacBook Pro 15" (Early 2008) 2.6 GHz Core 2 Duo (6MB L2 Cache)	102.50 seconds	Only 72.94 seconds! 29% faster

This benchmark measures the time (in seconds) it takes to execute a custom 21-step action script using Adobe® Photoshop CS3.

Lower times are better.

"RAM Hog" Results

RAM Configuration	Stock 2.0GB 2048MB (2x 1024)	OWC Powered 4.0GB 4096MB (2x 2048)
MacBook Pro 15" (Mid/Late 2007) 2.2 GHz Core 2 Duo (4MB L2 Cache)	297.68 seconds	Only 84.97 seconds! 71% faster
MacBook Pro 15" (Early 2008) 2.6 GHz Core 2 Duo (6MB L2 Cache)	250.28 seconds	Only 76.50 seconds! 69% faster

This benchmark times how long it takes to run our standard 21-step Photoshop action script in Photoshop CS3 when 50% of the installed RAM is taken up with another program.

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Also, although Dashcode allows the use of Widget plug-ins, it cannot create Widget plug-ins. You still need Xcode when programming Widget plug-ins.

If you create a Widget using Dashcode, your Widget will look similar to other Widgets created using Dashcode—so originality is not easily achieved.

How to package a Widget

Let us say that you have a minimal Widget, called HelloWorld—it just displays the “Hello World!” message inside Dashboard. This Widget only needs four files named HelloWorld.html, Info.plist, Default.png and Icon.png. The last three filenames are fixed, whereas the first one can be anything you want—provided that it is an HTML file—but its filename should be declared inside the Info.plist file.

So, you have your files and you want to actually “create and use” your Widget.

All you have to do now is put all the above files in the same directory. It is a good practice to use an explanatory directory name. I called mine HelloWorld. The next action is to go to the parent directory of the HelloWorld directory in order to rename it. The new name will be Helloworld.wdgt. A message asking you if you are sure about the new extension will appear and after answering yes you will get your first Widget ready for installation! The sign that you have successfully changed the directory type is that the directory icon will change.

Most of the time, it is good practice to have a copy of your Widgets as plain directories that contain the relevant files. It makes watching and changing the files easier as well as serving as a backup copy. Figure 2 shows the Command-I (using the Finder) information for a Widget bundle and the relevant plain directory structure, respectively.

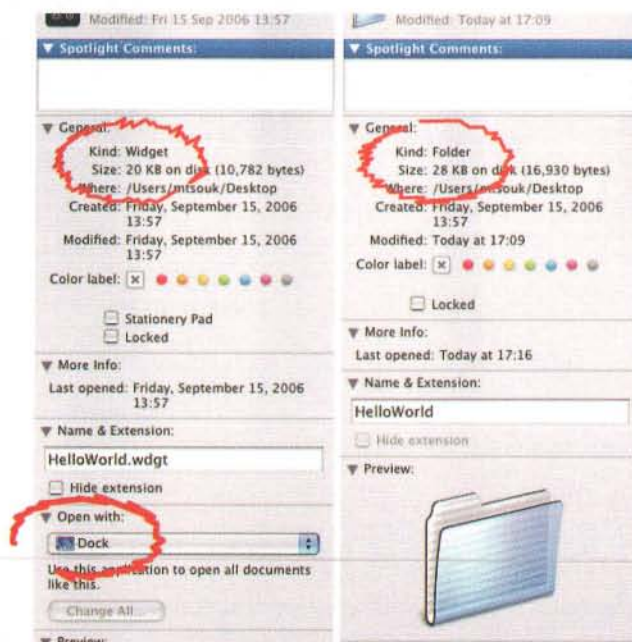


Figure 2: The Cmd+I output for the HelloWorld.wdgt bundle and the HelloWorld directory

Installing a Widget

There are two places that you can install a Dashboard Widget. Also, there are two ways for installing a Widget.

The first place for installing a Widget is in the /Library/Widgets directory. The Widgets that are located there are system wide, which means that everyone in the same Tiger/Leopard system can use them. The second place is inside the Library/Widgets directory that is located in each user's home directory. Your home directory is usually called /Users/your_user_name.

The first way to install a Dashboard Widget is to double click on it. Mac OS X will ask you if you want to install it and if you answer “yes”, it will put the Widget inside the Library/Widgets directory on your home directory. This directory is also called ~/Library/Widgets, with the tilde signifying your home directory in the UNIX jargon. This means that other users of the system cannot automatically use your Widget.

When double clicking a Widget, a message will ask you if you want to install it (this happens for security reasons). By pressing “Install”, you will go inside Dashboard and see Figure 3.



Figure 3: Trying to install the HelloWorld! Widget

If you answer “Keep” the Widget is going to be installed inside your home directory ~/Library/Widgets. If you answer “Delete”, the Widget is going to be placed in the Trash.

The second way is to manually copy the Widget bundle inside your preferred directory. You can still put it inside the Library/Widgets directory in your home directory (a.k.a. ~/Library/Widgets) but you can also install it manually in /Library/Widgets, provided that you have the required administrator privileges.

The Info.plist file and its keys

The Info.plist file is the property list file for every Dashboard Widget that is a XML file. Its filename is mandatory as well as its presence inside each Widget directory (or *bundle*



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if you prefer). The Info.plist file contains some keys, five of them being obligatory. Other keys may or may not be defined depending on the resources that are needed to be utilized by the Widget.

The **mandatory property list keys** are the following: CFBundleName, CFBundleDisplayName, CFBundleIdentifier, CFBundleVersion and MainHTML. All of them are of string type. The required properties are displayed in bold type in this list:

AllowFileAccessOutsideOfWidget: This key defines if the Widget is allowed to access the file system that is outside the Widget's directory. Access is limited by the permissions of the user that runs the Widget.

AllowFullAccess: This key defines if the Widget needs access to file system, Web Kit and standard browser plug-ins, Java applets, network resources, and command-line utilities.

AllowInternetPlugins: It defines if the Widget requires access to Web Kit and standard browser plug-ins.

AllowJava: It defines if the Dashboard Widget needs access to Java applets.

AllowNetworkAccess: This key defines if the Widget needs access to resources that are not file-based, including network resources.

AllowSystem: This key defines that the Widget requires access to command line tools using the Widget script object.

BackwardsCompatibleClassLookup: It defines if the Widget uses the JavaScript classes that are provided by Apple in a backward compatible way.

CloseBoxInsetX: It defines the offset for the location of the

Dashboard Widget close box on the x-axis. Allowed values are between 0 and 100.

CloseBoxInsetY: It defines the offset for the location of the Dashboard Widget close box on the y-axis. Allowed values are between 0 and 100.

Font: It defines an array of strings. Each string denotes the name of a font that is located inside the Widget's root directory.

Height: It is an optional number that denotes the height of the Widget in pixels.

Width: It is an optional number that denotes the width of the Widget in pixels.

MainHTML: The relative path to the Widget's main HTML file. If this is wrong, chances are the Widget is not going to work at all!

CFBundleIdentifier: This is the "unique" name of the Widget. Apple's Widgets are named com.apple.widget._widgetname_. Other Widgets are named similarly.

CFBundleName: A string that defines the name of the Widget. The string must match the name of the Widget directory on disk without the .wdgt file extension.

CFBundleDisplayName: A string that defines the text that is going to be displayed in the Widget bar and the Finder.

CFBundleVersion: This is a String that defines the exact build version of the Widget.

Plugin: It is a string that defines the name of the custom plug-in that is used by the Widget. Plug-ins are located inside the Widget's directory and are compiled Objective-C code.

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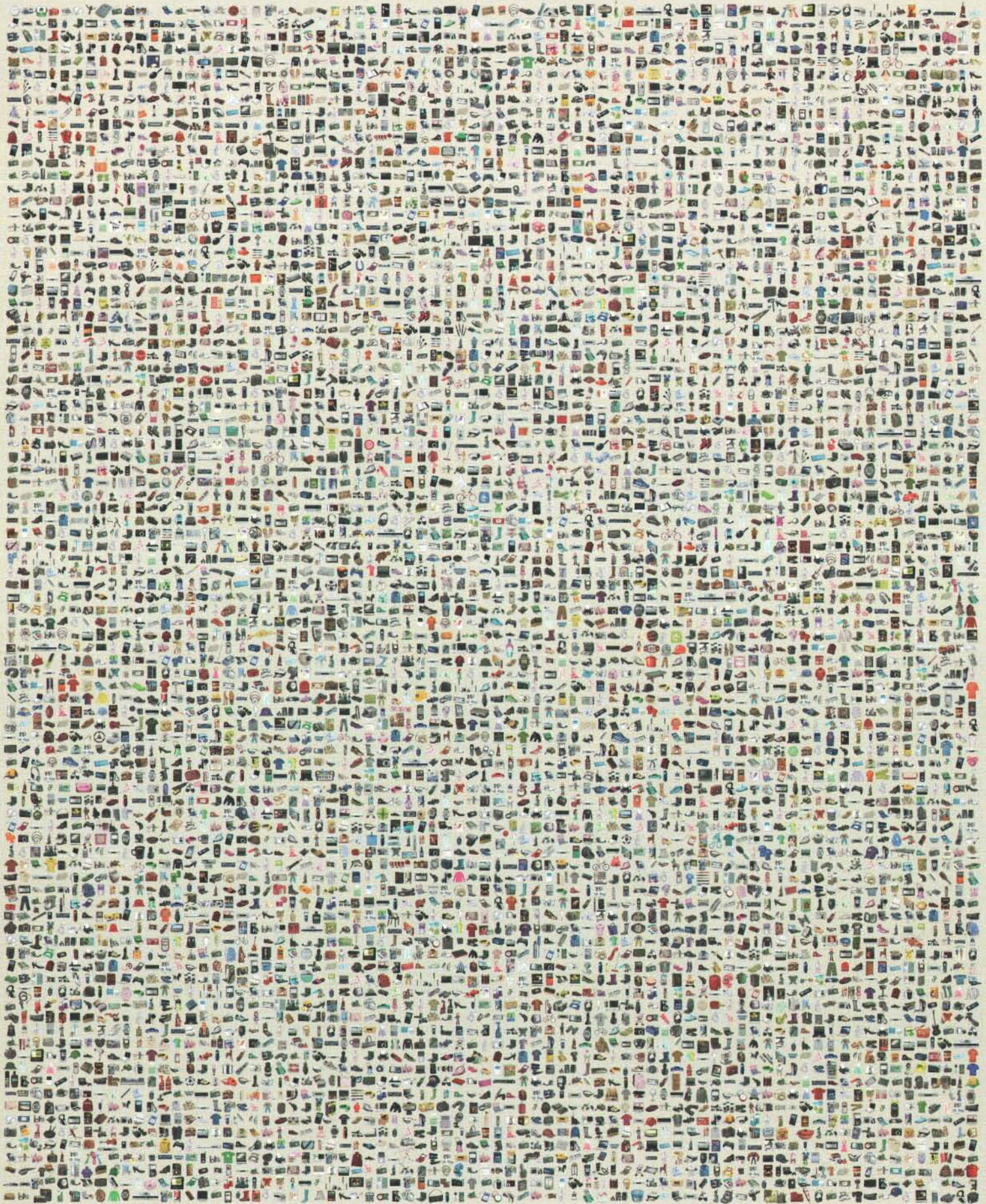


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The list is big but, as you already know, only five property list keys are **mandatory**. Most of them are optional, depending on what your Widget is planning to do. It is a very important task to define them the right way—both for security and functionality reasons.

It is important to remember that if your Widget does not work as expected or does not even show on Dashboard, the first thing to look is if the required property list keys are properly and correctly defined. It is a common mistake that can cause a lot of lost time in debugging.

The Property List Editor

The Property List Editor is for creating, altering and viewing an Info.plist file (and other .plist files) which is a plain text file in XML format. The main difference from a text editor like vi, emacs, or nano is that Property List Editor is a GUI application—some people find it easier and less error prone to use a GUI application than a traditional text editor. On the other hand, plain text editing is quicker and can be automated using a scripting language.

Be careful with the editor you use, as not every application saves in a plain text format. Be aware of software such as Microsoft Word for Mac or Macromedia (now Adobe) Dreamweaver to create a pure text file.

First, let me present you an example Info.plist file in XML format:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE plist PUBLIC "-//Apple Computer//DTD PLIST
1.0//EN"
"http://www.apple.com/DTDs/PropertyList-1.0.dtd">
<plist version="1.0">
<dict>
  <key>AllowSystem</key>
  <true/>
  <key>CFBundleDisplayName</key>
  <string>MakeTar</string>
  <key>CFBundleIdentifier</key>
  <string>com.mtsouk.widget.maketar</string>
  <key>CFBundleName</key>
  <string>Make Tar Widget</string>
```

```
<key>CFBundleShortVersionString</key>
  <string>1.1</string>
  <key>CFBundleVersion</key>
  <string>1.1</string>
  <key>CloseBoxInsetX</key>
  <integer>45</integer>
  <key>CloseBoxInsetY</key>
  <integer>35</integer>
  <key>MainHTML</key>
  <string>MakeTar.html</string>
</dict>
</plist>
```

The same Info.plist file in Property List Editor can be seen in Figure 4.



Figure 4: A Property List Editor example

Apart from the preamble of the Info.plist file, which is hidden in Property List Editor, the rest of the information is easy to be seen or altered. If you press the “Dump” button in the upper right corner, you will get the Info.plist in plain text format, including the preamble.

If you ask my opinion, I prefer the plain text version of the Info.plist file :-)) I rarely use the Property List Editor.

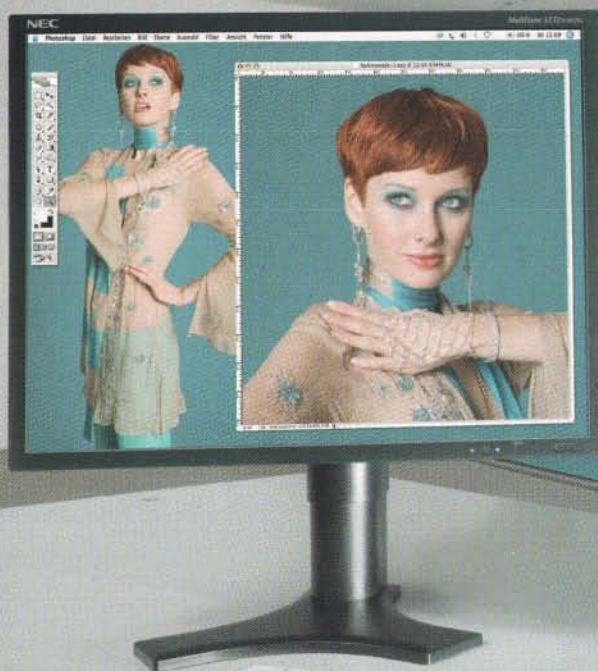
A Dashcode example

This part of the article will present you with a brief Dashcode example. I am going to create a complete Widget,



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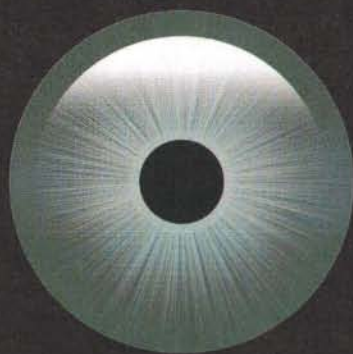
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for illustrating the Dashcode usage. In a previous article, I created a Widget that reads the RSS feed from MacTech.com and displays it in a Widget. I decided to create the same Widget using Dashcode. Please note that there is an existing RSS feed Widget template inside Dashcode that greatly simplifies the process.

Figure 4 shows the look of the Widget created in Dashcode. You can also dynamically change the length of the presented articles (using the backside of the Widget)—I should say that I am pretty impressed as it only took me 10 minutes to create it! It is also impressive that I did not write a single line of code!

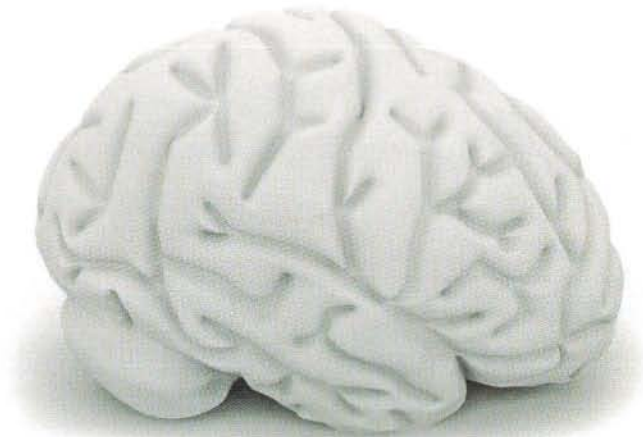


Figure 5: A Widget that reads RSS feed from MacTech.com

When launched, Dashcode presents a theme chooser. There are two RSS feed types: a generic RSS list type, and a "Daily Feed" template. The "Daily Feed" template shows only the current item from the RSS feed. I chose the "RSS" template for this example (see below).

Once chosen, Dashcode displays the main window with a graphical representation of the widget showing. By choosing "Widget Attributes" in the navigation bar on the left of the window, you can access and edit all properties of the widget. Figure 6 shows this screen, including the source for the RSS feed as well as some of the keys in the Info.plist file, the Widget identifier, its version number, etc. You can even add localization to your Widget.

Your email program does not have one of these:



Ours does.

Imagine an email program that was smart enough to observe and learn how you handle your email. Like offering to reply to certain types of email messages using a response you've previously sent. Or giving you the option to auto-file a message you've read based on how you've filed similar messages in the past. What if you could defer a message from your inbox for a few days or weeks, so that it magically reappears later when you're ready to deal with it? What if this program had an amazing junk mail filter that would leave your inbox devoid of spam? What if this program was as familiar and easy to use as Apple Mail?

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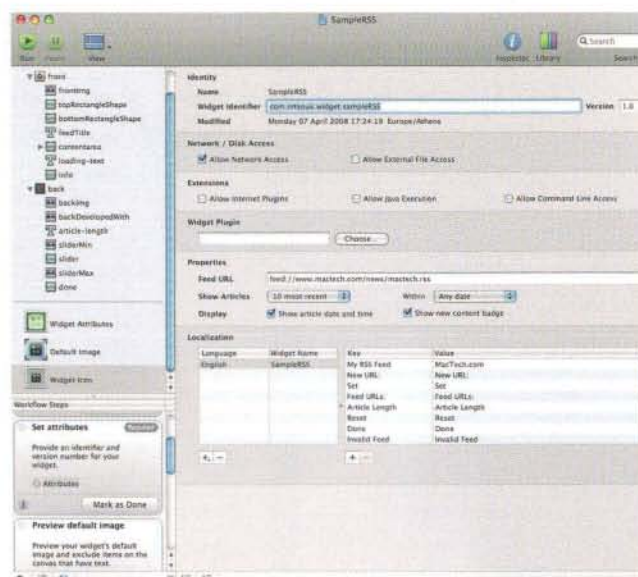
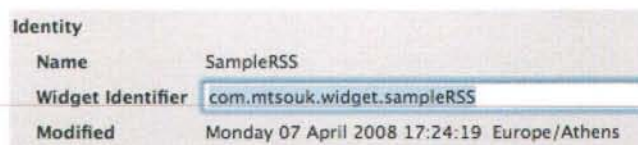


Figure 6: Setting attributes from within Dashcode

For more complex widgets, or just for a little hand-holding, you can also follow the “Workflow Steps” portion of the window to step through the process. If an attribute is required, Dashcode lets you know with a “Required” badge.



For the RSS widget, only two attributes are required: the Identifier, and feed property. The identifier differentiates one widget from another. Typically, identifiers are specified in reverse domain notation.



In this example, the identifier is `com.mtsouk.widget.sampleRSS`. The version number

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helps Dashboard to determine if you're running the latest version of a widget. The identifier and version fields correspond to the CFBundleIdentifier and CFBundleVersion in the widget's Info.plist file.

The other required property is the FeedURL and respective feed information.

Properties

Feed URL:

Show Articles: Within:

Display: ☒ Show article date and time ☒ Show new content

Then, by going to the File menu and selecting "Deploy Widget" (figure 10), you can export your Widget and have it as a separate object that you can distribute and install. After installing the Widget in Dashboard, it worked without problems.

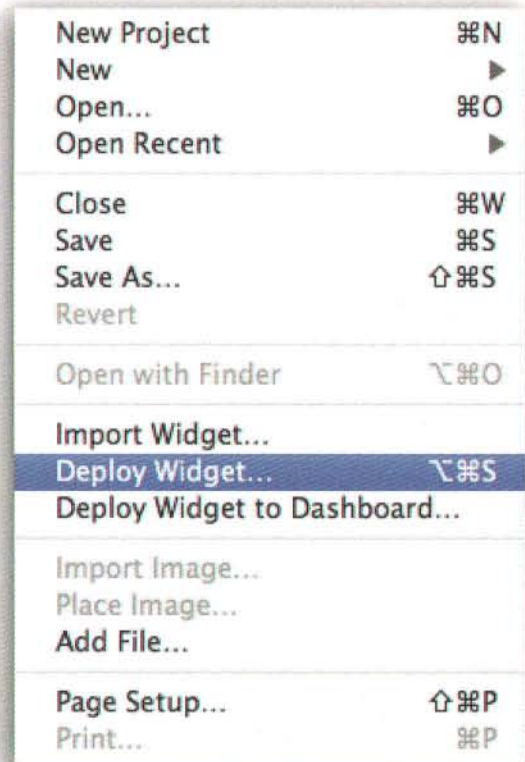


Figure 10: Deploying a Widget from Dashcode

I will also show you the list of the files that Dashcode creates at the root of the widget package using the UNIX `ls -al` command:

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```

mtsouk$ ls -al
.:
total 64
drwxr-xr-x  13 mtsouk  staff   442 Apr  7 17:36 .
drwxr-xr-x  24 mtsouk  staff   816 Apr  7 17:36 ..
-rw-r--r--   1 mtsouk  staff 4329 Apr  7 17:07 Default.png
-rw-r--r--   1 mtsouk  staff 1196 Sep 24 2007 Icon.png
drwxr-xr-x  14 mtsouk  staff   476 Apr  7 17:04 Images
-rw-r--r--   1 mtsouk  staff  832 Apr  7 17:36 Info.plist
drwxr-xr-x   9 mtsouk  staff   306 Apr  7 17:04 Parts
-rw-r--r--   1 mtsouk  staff 1840 Sep 24 2007
SafariStyle.css
-rw-r--r--   1 mtsouk  staff  4084 Apr  7 17:07
SampleRSS.css
-rw-r--r--   1 mtsouk  staff  3015 Apr  7 17:36
SampleRSS.html
-rw-r--r--   1 mtsouk  staff 31187 Apr  7 17:04
SampleRSS.js
-rw-r--r--   1 mtsouk  staff   295 Apr  7 17:24
attributes.js
drwxr-xr-x   4 mtsouk  staff   136 Apr  7 17:08 en.lproj

```

True to my preference for hand coded widgets, I'll point out that the Widget I created for processing the MacTech.com RSS feed for the previous article is a little bit smaller in size.

Conclusions

Creating Dashboard Widgets is easy provided that you know some basic things and follow some principles. Apple provides many tools that will help you write Widgets. One of them, Dashcode, is a handy tool provided that you can

understand its strengths and weaknesses. If you are an intermediate to experienced Widget programmer then it can save you time. If you are just starting Dashboard Widget programming then I would propose that you start programming Widgets without using Dashcode to truly learn the foundations of what goes into a widget.

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<http://en.wikipedia.org/wiki/Dashcode>

Mi

About The Author

Mihalis Tsoukalos lives in Greece with his wife Eugenia and enjoys digital photography and writing articles. He is the author of the "Programming Dashboard Widgets" eBook. You can reach him at tsoukalos@sch.gr.



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LBackup

Flexible backup for system administrators

by Henry Shustak, Infinity Architect

Project History

Since the project started over eight years ago various people have contributed to LBackup in one way or another. In 2007 the project was released under the GNU GPL and a website for the project was also established.

If you had asked me what I thought about backup ten years ago, I would probably have replied, "It is an important but extremely boring topic". However, my attitude towards backup since then has dramatically changed.

I was put in charge of backups at work. The company already had established a backup system. They were using commercial backup software to manage the data which were copied to tapes by an expensive and extremely slow (by today's standards) tape drive unit. I had been tasked with keeping the system running.

The backups were often running behind schedule. Initially, I assumed this was due to the tape errors which would often greet me on Monday mornings. It slowly dawned on me that the tape errors were not the only reason that I was perpetually playing backup catch-up. The primary issue was actually the limited amount of time that was available for the backup to run. Looking through the logs, I calculated that the backup would often take longer than the time available for the backup to run. I wanted to find a solution to this problem, but there were no inexpensive solutions readily available. This is what initially sparked my interest in backup technology.

A couple of years later, I enrolled at university. Initially, I used the school computers and the backups of my computer files were managed for me by the system administrators at the university.

There were not enough computers in the labs at university and the times which undergraduates were allowed access to the computer labs was strictly regulated.

Luckily, just prior to starting university, I had been gifted a second-hand laptop. This was a great gift and I convinced myself that working remotely from home would not only be more convenient, but also more productive. However, in reality, working remotely from home was intolerably slow. Therefore, it was not long until I had many important documents stored locally on my laptop rather than on the university computer system.

Backing up these locally stored files manually was not an attractive option. In addition, I did not want to return to the daily competition with other students for computer access.

If something was to happen to my laptop and was to I lose all my schoolwork, I could fail multiple courses. The danger of my situation was reinforced by the recent memory of installing a new hard drive for the previous owner of my laptop due to a hard drive failure.

It was time to take action. I began researching various backup solutions that would protect my precious files. The initial aim of this project was not to build a backup system; it was to find an existing backup tool that was reliable, simple, unobtrusive and most importantly inexpensive.

After testing various backup systems I eventually, settled upon rsync. I was delighted that my important schoolwork was now backed up. I had no idea at the time that this script which had been whipped up for testing was going to evolve into LBackup.

Not long after installing and configuring the script on a few machines, I realized there were some new features which I desperately required on some of these new setups. I manually added the new feature to each installation as required. After repeating this process a few times it became clear that there had to be a better way. A more sensible approach would be to separate the code which performed the backup, from the configuration information which contained the details of how to perform the backup, on each individual machine.

I spoke to a friend whom I had met at university about the problem and together we worked out a solution. It was not long before an example configuration directory was included and the system became commonly referred to as LBackup.

Adding the configuration system meant that additional features could easily be added as required.

About LBackup

LBackup is an open source backup tool. It relies on many other open source tools in order to function.



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A basic LBackup configuration file often takes less than 10 minutes to setup (excluding the time required for testing). Although the current version of LBackup is not yet as easy to setup as Time Machine, it is completely customizable.

Below is a list of the key LBackup features as of version 0.9.8q6.

- Designed for user data backup
- Full backup tree
- Encrypted backups (Transport and Storage)
- Email reports
- Hard links (Saving Space)
- RSync back-end (Reliable)
- Pre and post actions (such as mounting and un-mounting volumes)
- Network backup
- Automation

All these features are documented in further detail on the LBackup website.

Basic Backup Tutorial

After completing this tutorial you should have an idea of whether LBackup is right for your needs. This tutorial aims to provide you with a feel for how LBackup works. This tutorial assumes you are running Mac OS 10.4.x or later and that you are familiar with using Mac OS X.

- Step (1): Create a new directory on in the `/Users/Shared` directory called *source*.
- Step (2): Create another new directory in the `/Users/Shared` directory called *destination*.
- Step (3): Visit the LBackup web page and download the latest version of LBackup
- Step (4): Run the LBackup installer and follow the on screen instructions.
- Step (5): Open the root directory on the system which you just installed LBackup.
- Step (6): Open the *lbackup* directory within the root directory.
- Step (7): Copy the *example_backup_config* directory into the `/Users/Shared` directory.
- Step (8): Rename the directory you copied in the previous step to *testinglbackup*.
- Step (9): Locate the file called *example_backup.conf* within the *testinglbackup* directory.
- Step (10): Rename the *example_backup.conf* file to *testinglbackup.conf*.
- Step (11): Edit the configuration file so it is the same as the listing below.

```
backupConfigurationVersion=1006  
useSSH="NO"  
sendGrowlNotification="NO"  
backupSource=/Users/Shared/source  
backupDest=/Users/Shared/destination
```

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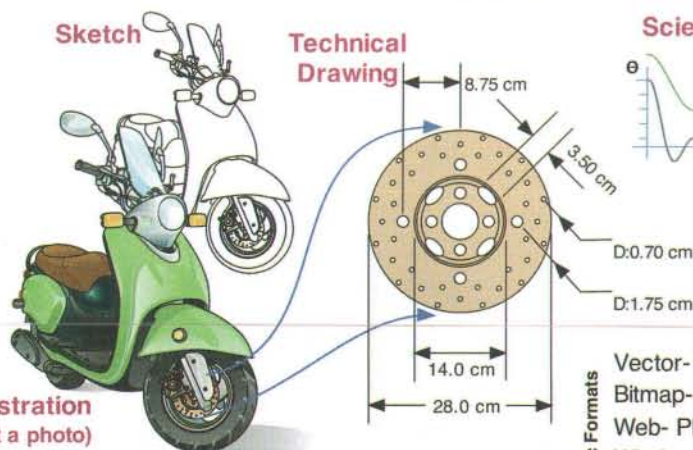
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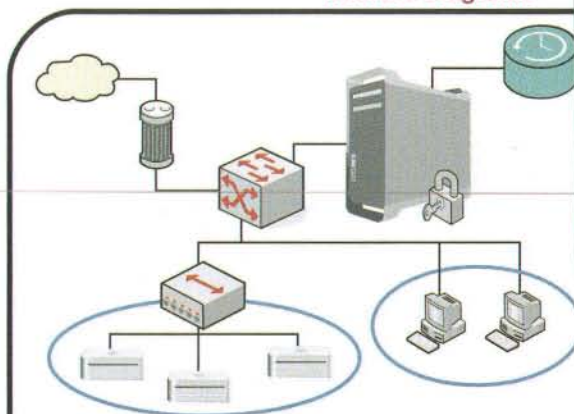
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```
log_fileName="TestingLBackup.log"
```

```
excludes_filename=excludes.txt
```

```
numRotations=8
```

```
ssh_permit_standard_rsync_version="YES"
```

Step (12): Open a Terminal.

Step (13): Type the following into the terminal and then press return.

```
/usr/local/sbin/lbackup
```

```
/Users/Shared/testinglbackup/testinglbackup.conf
```

Next you should see something similar to the following as output on the terminal:

```
Loading Backup Script Configuration Data...
```

```
Checking for Pre Action Scripts...
```

```
First Run Full Copy...
```

```
Synchronizing...
```

```
Number of files: 1
```

```
Number of files transferred: 0
```

```
Total file size: 0 bytes
```

```
Total transferred file size: 0 bytes
```

```
Literal data: 0 bytes
```

```
Matched data: 0 bytes
```

```
File list size: 62
```

```
Total bytes sent: 74
```

```
Total bytes received: 20
```

```
sent 74 bytes received 20 bytes 188.00 bytes/sec
```

```
total size is 0 speedup is 0.00
```

```
real 0m0.153s
```

```
user 0m0.004s
```

```
sys 0m0.018s
```

```
Rotating Backups...
```

```
Performing Atomic Swap...
```

```
Checking for Post Action Scripts...
```

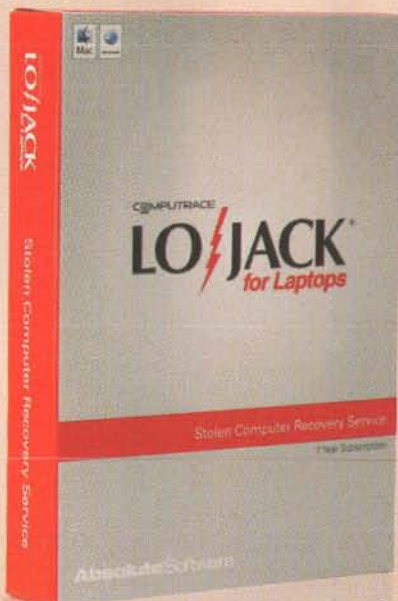
```
Backup Completed Successfully
```

You have just configured and run LBackup. Check inside the destination directory you created in *step (2)* and you will see a new directory called *Section.0*. This directory contains the latest successful backup of the *source* directory which you created in *step (1)*.

Add some files or directories into the *source* directory. Then run LBackup again by following the instructions in *Step (12)* and *Step (13)*. There will now be two directories in the destination directory. One called *Section.0* and one called *Section.1*. If you open the latest backup directory (*Section.0*), then you should see a directory called *source*. If you open this *source* directory then any of the files and directories you placed in the backup *source* directory should also be visible.

If you would like to exclude files from being copied from the source directory to the destination directory then edit the *excludes.txt* file located within the *testlbackup* directory which is located within the */Users/Shared* directory.

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MetaData Preservation

On Mac OS X systems, many file system objects have associated metadata. The extended file system (HFS+) supports the storage of this metadata. It is important that you check your backups and ensure that any required metadata is being preserved before you accept any backup system as a suitable backup solution.

The compilation options of rsync and the run time flags specified by LBackup determine which metadata is preserved when you run LBackup.

On a Mac OS X systems, the user who executes the backup is also an important factor in preserving metadata. For example, if your backup policy states that preserving the POSIX (portable operating system interface) owner and groups of files and directories is important. Then you should run the backup and check that this data has in fact been preserved.

The ownerships are a special case when performing a backup on Mac OS X systems. This is because the only user who is capable of the modifying the owner of existing file system objects is root. Therefore, if you are backing up files that belong to various users, it is important to run LBackup as root so this metadata is able to be preserved. For example, if you were to run the backup as user with UID (user identifier) 508 then all the files which are backed up will have the POSIX owner set to 508 regardless of whether the file system object being backed up had this UID.

Restoring a File or Directory

To restore a file or directory to the desktop simply locate the file or directory you would like to restore within the backup destination directory and then copy this file or directory to the desktop.

When restoring a file or directory, metadata preservation may still be important. For example, if you were going to restore a network home directory, then it would be advisable to copy (restore) the directory as root. This will preserve the permissions of the NHD and its contents.

User Access to Backups

Because LBackup stores the backup(s) in a file tree rather than in an archive, it is possible to configure the backup directory so it is available via the network, as a read only share point. Such a setup will allow users to perform file level restores, without needing to contact the backup operator.

Why is Lbackup Open Source?

In 2007, it was decided that LBackup should be available to anyone and everyone for free. One motivation behind the decision was that I and many of the companies I was working with preferred to use an open source backup solution when available and appropriate. Another reason behind the open-source move was that rsync had also been released under the

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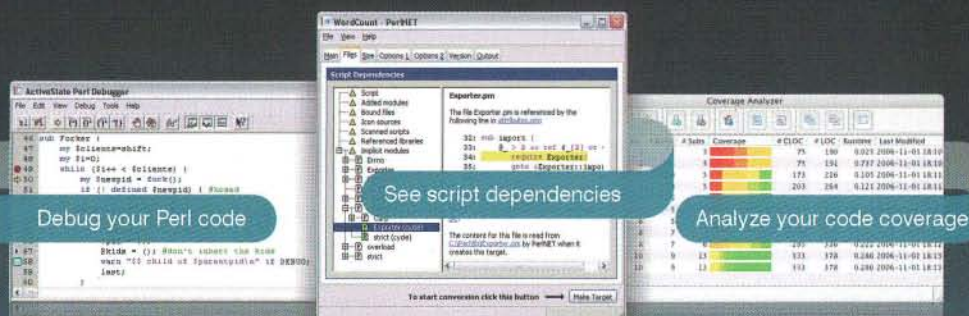
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GNU GPL and as such this was an obvious license to release LBackup under. However, the most important reason for open sourcing the project was to ensure that other people would have a tool which could be quickly and easily modified to meet their own specific needs.

Essentially this means that if you add a feature, then everyone else using LBackup also benefits from your work and vice versa. Open source development makes sense on many different levels for this kind of project.

Why the Crazy Version Numbers?

I have been using LBackup at home for more than eight years and at work for more than four years. A goal of a "1.0" release is a GUI which will allow users to create a basic LBackup configuration.

The future of LBackup

I would like to see a clean up of the code. It is nothing a little re-factoring will not fix. I am sure this will happen at some stage in the near future.

In addition to a general code clean up, there are some other new features listed below which I believe people would find handy:

- A GUI offering even basic backup setup options.
- Some bundled scripts for shutting down and starting up various databases.

An installer or some sort of automated setup of network backup client(s).

A system for handling network backup clients that come onto and off the network.

(I have heard that TimeCapsule and Time Machine does a pretty good job under 10.5)

Some bundled scripts for performing various database dumps.

A bundled script to handle backup locking

A system to make the setup of encrypted backups a little easier.

A pre- or post- script which performs a malware scan of the client or client data.

Possible integration with Link-Backup (which looks like an interesting backup system!).

There are of course many more features that other people are sure to need and may even develop. The LBackup team is always open to ideas. If you feel like adding a feature or just tidying-up some code then please consider joining the LBackup team, thus making the world a better place.

LBackup Support

If you require assistance with the setup or integration of LBackup, then Lucid Information Systems is available to help. Lucid offers on-site support for LBackup in selected regions. Visit their web page for contact details.



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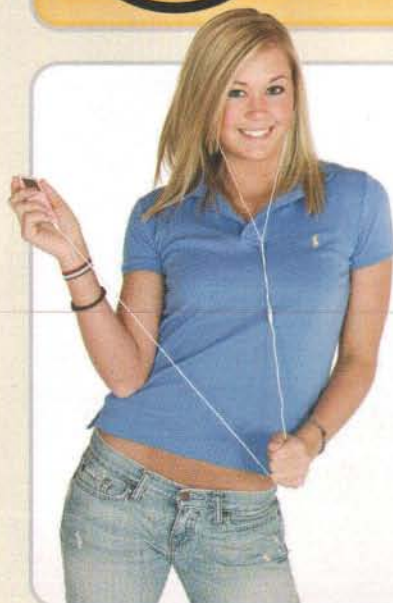
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LBackup Pre and Post Scripts

LBackup supports pre and post scripts. This per-configuration feature is useful, if you would like to perform certain actions before or after a backup.

The LBackup scripting sub-system opens up a great deal of flexibility to those who are comfortable with programming. In addition LBackup ships with a variety of example scripts. The example pre and post scripts offer a way for you to get started quickly with the LBackup scripting subsystem.

The pre and post action examples may be found in the LBackup *example_backup_config* directory. If you open the *resources* directory and then open the *example-scripts* directory you will be able to browse through the example scripts.

One of the example scripts for Mac OS X users, allows LBackup to perform a push backup via SSH to an encrypted disk image. This script requires that you have installed MacFUSE and the MacFUSE SSH File System module. This pre script will mount the directory of a remote machine via SSH. Then it will proceed to mount an encrypted disk image that may be configured as the backup destination for this LBackup configuration.

There are also associated post scripts to unmount the encrypted disk image and the SSH mount point.

LBackup also ships with a variety of scripts to handle local drives and image files. With regards to the LBackup scripting interface, your imagination is the limit.

The LBackup scripting subsystem and the bundled scripts allow the configuration of redundant encrypted backups for a single data source. This way should something happen to one of your encrypted backups, your data should still be safe in one of the other encrypted redundant backups.

More Scripting

LBackup is command line and configuration file driven. Therefore, it is possible to build control systems which wrap around or extend LBackup.

For example you may want to create backup chains or integrate LBackup with third party (or your own) analysis and monitoring tools.

Documentation and Development

The LBackup development and documentation is open for editing. Provided this is not abused, the intention is to keep it this way.

This means you are able to look into the future of LBackup and even express your opinion with regards to development decisions and directions..

In addition, you have the ability to fix any spelling or grammatical errors you may find within the documentation. You may even end up adding some pages on how to perform some sort of special backup routine using LBackup.

Conclusions

Let your backup policy dictate your requirements. Then find a system that is a good fit. Also, try different backup systems and see which system is the best for you and your requirements.

You may find that you end up using more than one backup system. For example, one system may not cover all of your requirements or you may find that one system will work better in certain situations, while another will work better in other situations.

Have a look at the LBackup web page and screen casts and then give it a try.

Other Notable Free Backup Tools For Mac OS X

If you are looking for a free backup tool for use with Mac OS X then the following free tools are defiantly worth investigating.

Carbon Copy Cloner

rdiff-backup

rsync

Time Machine (requires 10.5 or later.)

Rsnapshot

Link-Backup

Related Links

LBackup : <http://www.lucidsystems.org/lbackup>

GNU GPL : <http://www.gnu.org/copyleft/gpl.html>

Carbon Copy Cloner :

<http://www.bombich.com/software/cccl.html>

rdiff-backup : <http://www.nongnu.org/rdiff-backup/>

rsync : <http://samba.anu.edu.au/rsync/>

Rsnapshot : <http://www.rsnapshot.org/>

Time Machine :

<http://www.apple.com/macosx/features/TimeMachine.html>

TimeCapsule : <http://www.apple.com/timecapsule/>

Link-Backup : <http://www.scottlu.com/Content/Link-Backup.html>

MacFUSE : <http://code.google.com/p/macfuse/>

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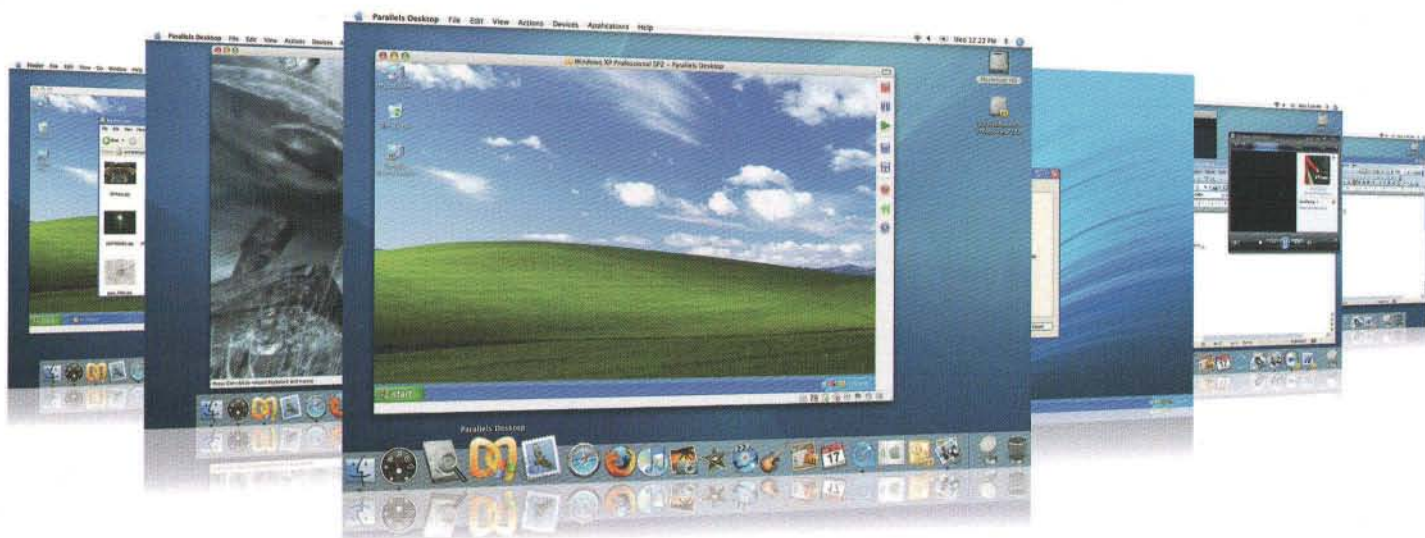
About The Author

In 1982, Henri used an Apple Computer for the first time. It was an Apple][e and ever since he has enjoyed programming.

Henri is not the only one who has loaded data onto a computer and has then later been unable to retrieve this data. However, in spite of these experiences, he continues to use computer systems designed by Apple to store various digital information. More recently he has made an effort to prevent the loss of this data by trying, building, deploying and testing various digital data protection systems.

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MacTech Salutes the 2008 Apple Design Award Winners

MacTech Magazine would like to salute the winners of this year's Apple Design Awards. Presented at WWDC 2008, these winners represent the best of the best – really cool concepts that take advantage of all that OS X has to offer.

Winners by Category

Best Mac OS X Leopard Application	ScreenFlow 1.1.1	Vara Software Limited
Runner-Up	Bee Docs' Timeline 3D Edition 2.1	Bee Documents, Inc.
Best Mac OS X Leopard Graphics and Media Application	ScreenFlow 1.1.1	Vara Software Limited
Runner-Up	FotoMagico 2.2	Boinx Software Ltd.
Best New Mac OS X Leopard Game	Guitar Hero III: Legends of Rock 1.1	Aspyr Media, Inc.
Runner-Up	Command & Conquer 3 Tiberium Wars 1.09	Electronic Arts Inc.
Best Mac OS X Leopard User Experience	Macnification 1.0	Orbicule BVBA
Runner-Up	Checkout 2.1	Werck BV
Best Mac OS X Leopard Student Product	Squirrel (alpha)	Axel Péju
Runner-Up	Flow 1.0.1	Brian Amerige
Best iPhone Web Application	Remember The Milk for iPhone & iPod touch 1.0.	Remember The Milk
Runner-Up:	AP Mobile News Network 1.0.	The Associated Press
Best iPhone Game	Enigma 1.0	Pangea Software, Inc.
Best iPhone Healthcare & Fitness Application .	MIM 1.0 (alpha)	MIMVista, Corp.
Best iPhone Social Networking Application ...	Twitterrific 1.0 (beta)	The Iconfactory
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Creating a Backup Policy

Design and document an effective backup system for your business

by Joe Kissell

The president of a company I once worked for was fond of bragging that even if the headquarters building burned down overnight, all the organization's data would be safe and business could go on more or less as usual tomorrow. He slept soundly knowing that the company's computers were backed up daily and that a current set of data tapes was kept in a secure offsite location. Fortunately, the company never experienced a devastating data loss that put this system to the test, but at least someone had carefully thought through the matter of backups and prepared a disaster recovery plan.

I had to wonder, though, if all the company's data was truly as safe as my boss thought. No one ever told me, an ordinary employee, how the backup system worked. Were the Mac and PC on my desk among the computers that were backed up regularly? If so, how—and how often? (I was unaware of any backup software running on them.) What would I have had to do if I needed to restore a lost file? Did the company's IT people ever check to make sure the data on those tapes was really recoverable?

These are just a few of the things that should be spelled out in a backup policy—a brief document that describes, concisely and in plain English, how your organization deals with backups. Although it may be left to the IT staff to sort out the technical details and implement the policy, everyone in the organization who creates or uses digital data should know what the policy says or at least where to find it.

Of course, if you're talking about backing up a handful of Macs in your home, you don't need a policy at all; you only need a plan, which could be as simple as "Buy Time Capsule. Plug in. Activate on all Macs." However, what works well for individuals, families, and small offices doesn't necessarily scale to larger businesses.

In this article I discuss many of the considerations involved in creating a backup policy for your organization. The point of developing a formal policy is not merely to

spell out what you already do, but to think through a number of important issues that are often overlooked. If your organization has a backup system in place already, working through a policy statement can reveal holes and shortcomings that should be addressed. If you have no backups, a solid policy can serve as a guide to set up the right sort of system, saving time, money, and aggravation later on.

Start on the Right Foot

Let me be blunt: an awful lot of people—not only technologically clueless executives but even otherwise savvy IT guys—take a completely backward approach to backups. They learn about some nifty piece of hardware or software, get it in their heads that it's the answer to all their backup needs, and then try to design a plan around that toy. This can be seriously bad news; your company can get stuck with completely inadequate backups despite using what appears to be the latest and greatest (or, at the other extreme, tried and true) technology. The much wiser approach is to decide first exactly what you want to accomplish, and then go find the tools that enable you to get that done.

Needless to say, we don't live in a perfect world, and any number of situations might force you to make do with less-than-ideal hardware or software. Even if you know your hands are tied with, for example, a legacy hardware system and a tiny budget, I still recommend crafting your policy initially as though those limitations did not exist. By the time you're done, you may discover a workaround. At the very least, you'll be able to demonstrate a gap between what your company needs and what you can provide. If you can show the Powers That Be how effective and crucial your ideal

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policy is and then point out the gaps between that and what you currently have, you never know—someone just might be able to authorize an infrastructure change or find more money to spend on solving the problem.

With that said, let's look at the three major categories of information your backup policy should contain: backup procedure, media management, and data restoration. Although I go into some detail here about each aspect of your policy, keep in mind that we're looking for a concise end result—a brief outline or maybe a dozen bullet points that should fit on a single sheet of paper.

Backup Procedure

Your backup procedure encompasses several main points: what data you back up, using what method(s), how often, and to what media. Each one of these matters involves a number of decisions.

What Data Should You Back Up?

Without a doubt, one of the most important things your backup policy should state is precisely *which* data is backed up. Some people would immediately say "all of it," but that's not necessarily a smart thing to do. As the amount of data you back up increases, so does the time it takes for each backup to run, as well as the amount of storage space needed—not to mention network congestion. All of this may not be a big deal when you have half a dozen computers, but

it's a nightmare waiting to happen when you're talking about hundreds or thousands.

You probably do not need to back up the operating system and preinstalled applications for every single computer on your network. For one thing, this could result in massive duplication of files (though admittedly, some backup software is smart enough not to store multiple identical copies of a given file). For another, it's probably unnecessary in that your IT department likely has preconfigured startup drives, or even spare computers, that could be used in the event of a serious disk failure. In most cases, it should be sufficient to back up individual user data—as in the user's home folder on Mac OS X or Windows, or even a subset of that folder, depending on where and how your users store their data. If your network is set up in such a way that home folders are stored on a server, you may not need to back up individual workstations at all.

Users may have some files that should *not* be backed up for one reason or another—for example, Photoshop scratch files, caches, or personal files that just happen to live on a company machine. It's helpful, therefore, to state explicitly in your policy not only what's included in a backup, but also what's excluded. Your policy might state that all files put in a designated "Do Not Back Up" folder will be omitted from backups, or that MP3 files and photographs, regardless of their location, won't be backed up (if they're deemed to be irrelevant to your business).

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The situation changes, though, when talking about servers rather than individual users' workstations. You very likely do want every single file on your servers to be backed up, assuming that the servers are crucial to the operation of your business and that only business-related files reside there. You may already have mirrored RAIDs in place to reduce the risk of downtime due to disk failure, but a RAID by itself is not the same thing as a backup. If you have a multi-drive mirror and you periodically swap out drives, then you do have some additional insurance against accidental file changes or deletions. You may also want to create separate bootable duplicates of your servers' drives on a regular schedule, or simply include the server's drives in your regular archiving scheme. In any case, spell this all out in your backup policy.

Be aware that, depending on the size, structure, nature, and location of your business, you may be required by law to maintain copies of certain kinds of data for a specified period of time. Before setting your backup policy in stone, consult with a legal expert to determine which data you must be certain to include in your backups.

What Is Your Backup Method?

When I say "method" here, I'm referring to full versus incremental or differential backups. (Although "incremental" and "differential" mean different things to different people, one common usage is for a differential backup to contain all the data that changed since the last full backup, while an incremental backup contains only the data that changed since the last update. Incremental backups run faster because they contain less data, but differential backups may be easier and quicker to restore, especially if you use tape drives.) Your policy should state under which circumstances one method or another is used. For example, you might specify that a full backup occurs once a month with incremental backups twice a day and differential backups once a week. If the method is different for servers than it is for workstations, say what those differences are.

How Are Backups Scheduled?

Your backup policy should state how frequently backups run, whether that's several times a day, a couple of times per week, or whatever. Backups are often scheduled to run after hours, when they'll have the least impact on users' work. Although you can't precisely state how long a backup will take, you can say something like "Backups begin every morning at 2:00 A.M." or "Backups run between midnight and 6:00 every weekday morning."

Increasingly, backup software that runs only on a fixed schedule is becoming "old school." Some backup software constantly watches for changes and copies new or altered data after a short delay (say, 15 minutes). Other software simply checks to make sure any given computer was backed up at least once within, for example, the last 24 hours—providing flexibility for users of laptops or other computers that aren't always available on the network.

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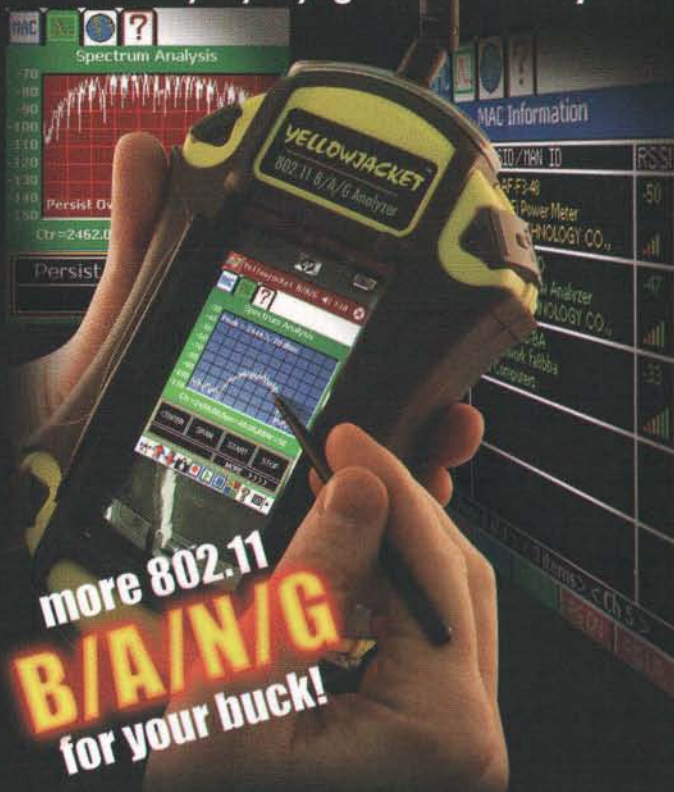
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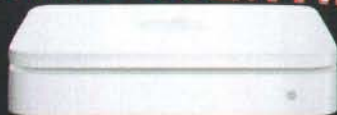
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One way or another, be sure your policy (and the software choices that you make as a result of it) can accommodate mobile users. If your policy states that backups of networked computers always and only occur at three in the morning, laptop users might never get backed up. Explicitly state whether or not network backups will occur while users are outside the office—and if so, whether remote users have to do something special to make that possible (such as connecting to a VPN).

What Media Do You Use?

In most large organizations, high-capacity tape drives of one sort or another are taken for granted as a backup medium, often with an automated loading and retrieval system. That may indeed be the best choice for your business, but it's not the only option. In particular, given the rapidly rising capacities and falling prices of hard drives, you may find that some sort of hard drive array is just as economical, while providing much faster performance, especially for restoring files (since the data can be read nonlinearly). Your written backup policy can perhaps be worded in a generic way to accommodate potential changes in the media you use, but think through the implications carefully. For example, the schedule and means by which sets of backup media are rotated offsite might be very different for a hard drive array than for a stack of tapes.

Media Management

The next section of your backup policy should discuss how your physical backup media is handled. This includes rotating among multiple sets of media; recycling, replacing, or destroying old media; storing backups offsite; and keeping your backup media encrypted.

Rotating Media

All backup media is subject to failure—for any number of reasons. A smart backup policy assumes that a certain percentage of media will fail much sooner than it should. The usual way to deal with this unfortunate fact of life is with redundancy: have two, three, or more copies of each backup and rotate them on a regular basis. For example, if you're backing up to tapes, you might have three complete sets, each of which contains a complete backup of all your systems. Use Set A on Monday, and then switch to Set B on Tuesday, Set C on Wednesday, back to Set A on Thursday, and so on. When a set is not in active use, keep it stored offsite in a safe location (see "Offsite Storage," ahead).

Your backup policy, therefore, should specify not only how many sets of media you have but also how they're rotated. Do you switch sets daily, weekly, or at some other interval? At what time do the rotations occur? Who's in charge of moving the media around?

This may be a good time to mention media labeling as well. Because any number of people may (either now or in the future) have to deal with your backups, you should

develop a scheme for labeling physical media that makes it crystal clear what's on it. This should include, at minimum, a designation for the set to which it belongs, a number identifying its sequence within the set, and the date on which it was first used. For instance, "Set Alpha, Tape 3, 6/1/2008." Depending on how complex your backup system is and the sort of media you use, you may need more information too, but the key is to make it obvious to anyone who might be using the system what data is on what media.

Dealing with Used Media

Sooner or later, you'll fill up whatever media you use for backups. If you're backing up the computers for an entire university onto tapes, maybe this happens numerous times each day; if you're backing up a few computers from a small office onto a high-capacity RAID, it might not happen for months or years. (Sure, there are ways of selectively erasing old data from your backups, leaving only more-recent copies of your files, but even so, the volume of backup data is bound to exceed your media's capacity eventually.) In any case, your backup policy should specify exactly what happens when a storage device fills up. You have a few main choices:

- **Recycle:** Erase the media and record over it.
- **Store:** Hang onto the full media.
- **Destroy:** Ditch the old media in a way that prevents anyone else from reading your backups.

If you choose "store" or "destroy," you'll start over with new, blank media. Regardless of your choice, list the details. If you recycle media, how many times will you do that before storing or destroying it? Do you replace an entire set of media all at once (generally a good idea) or by the individual piece? How long will you store old media, and where? If and when you destroy old media, how will you do so securely? (And, just as a reminder: you may be legally obligated to maintain certain kinds of data for a number of years—be sure to check before destroying anything.)

In addition, because media reliability decreases over time, you should plan for any media to "expire" after a certain point—full or not. I wouldn't trust a ten-year-old hard drive to store critical data, for example. How long you choose to trust your media will depend on your personal experience, the manufacturer's MTBF (mean time between failures) ratings, educated guesses, your budget, and so on. However you determine the schedule, do plan to replace your media at regular intervals.

Offsite Storage

Remember my boss, the guy who wasn't worried about the building burning down? You, the person designing your business's backup policy, should *definitely* worry about that! It's all well and good to keep backup media in a fireproof safe or other secure location onsite, but you must also have at least one copy (and preferably more than one) stored *in another building*. As unlikely as it may be, something could happen—theft, espionage, earthquake, terrorist attack,

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whatever—that destroys all your backups if they're kept in a single location. Don't take any chances. You already specified that you have more than one set of media in rotation, so designate a safe offsite location to store media that's not actively in use, as well as a system for shuttling media back and forth. Needless to say, you don't need to share the precise location of your offsite backups with every employee in your company, but you should make sure that several trustworthy people know it, in case something happens to you.

Encryption

Let's take for granted that your backups contain valuable, confidential data about your business that should not fall into anyone else's hands. It could be that your server room is highly secure, but as soon as you take backup media offsite, it becomes vulnerable—especially while in transit. And even if you employ armed guards and armored cars for transport, there's always the chance that a nosy or disgruntled employee with access to your backup equipment could poke around in your backup data. So I strongly recommend specifying in your backup policy that all backups will be encrypted, and I leave it to you to figure out what method of encryption meets your organization's needs the best.

Encrypted data is useless unless someone knows the pass phrase. As with any important password, you have to strike a balance in security. If the system administrator is the only one who knows the pass phrase and gets hit by a bus, your business will be in trouble. So carefully choose a small number of people who'll be trusted to know how to decrypt your backups if the need arises.

Data Restoration

Backups are of no use whatsoever if you can't restore your data when you need it. Unfortunately, restoration is usually the part of a backup policy that gets the least attention. Give careful thought to all the different scenarios for restoring data that might arise, and make sure your policy spells out the following information.

Who Can Restore Files?

In most business situations, only an IT person can restore backed-up files, since they reside on a secure server and since it would be all too easy for a user to mistakenly overwrite good files with backups. The downside, of course, is that restoration can be inconvenient and time-consuming for the user as well as for the IT staff. You could choose to implement a backup system in which individual users can directly restore files, if you're aware of the trade-offs and willing to live with them.

If restoring backups is the responsibility of a network administrator, your backup policy should state exactly who has this capability, and how to reach the person or department in charge. It should further specify the hours and

days during which it's possible to restore backups and what to do in case of an off-hours emergency.

What Is the Procedure for Restoring Files?

Assuming your users have to go to the IT staff to get files restored, exactly what is the process—make a phone call? Fill out a form on the intranet? Send an email? What if the user doesn't know the exact file name, date, or location? Is there a different procedure if a whole drive or user folder has to be restored? Spell out, in simple end-user terms, what someone has to do to get back data that's in the backup archives somewhere. And, if you have a system that lets users restore their own files, point them to a step-by-step guide on a Web page somewhere for how to do this.

You, as an enlightened techie, will understand that it's not always quick or easy to retrieve data from backups. In some cases, it might require fetching an offsite data set, waiting until there's a free tape drive, and laboriously searching through archives. But lots of people will assume that restoration should be immediate. Therefore, it doesn't hurt to put estimated time ranges for restoring files in your backup policy so that your users can set their expectations appropriately.

How Is Data Integrity Verified?

You can't assume that your backups are perfectly and indefinitely intact, just because your backup software didn't report any errors. Stuff happens. Make it an explicit part of your backup policy to test backups on a regular basis. When I say "test," again, I don't merely mean run through a verification procedure with your backup software. I mean actually restore files. Ideally, you should at least spot-check a few random files on each piece of physical media once every month or two. Less frequently, it wouldn't hurt to attempt much larger restorations. If you catch bad media or unreported software errors early, you'll be able to make adjustments before someone actually needs a file.

Other Details

Beyond the three key categories of backup procedure, media management, and data restoration, you may want to think through a few more miscellaneous details and include them in your backup policy.

Definitions

Because your backup policy is a document intended not just for computer geeks but for executives and run-of-the-mill employees, make sure you spell out exactly what everything means in nontechnical language. It might be helpful to have a brief "definitions" section toward the beginning where you state just what you mean by words like "backup," "incremental," and "restore."



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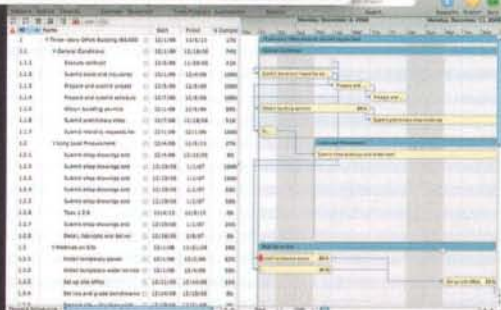
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Responsibility

Even though you've already specified where people go when they need to have files restored, your policy should also indicate other responsible parties. Who has physical access to the backup media? Who knows the pass phrase for encrypted backups? Who makes the policy decisions? These might be titles or positions rather than individual names, but either way, make it clear.

Maintenance

The hardware that backs up your computers—the servers, tape drives, hard drives, and so on—needs routine cleaning and other maintenance. Some components may need to be replaced or upgraded from time to time. Backup software will require updates. State in your backup policy who's responsible for maintaining the system, and (at least in broad terms) what sort of maintenance schedule is followed.

Private and Public Policies

I've been advocating the creation of a backup policy that every single computer user in your organization will read. But some facts aren't really for public consumption—things like encryption pass phrases and the exact location of offsite storage. Also, some of the implementation details are too technical for the average user to be concerned with. So consider creating two different versions of your policy statement. One will be a short, snappy, one-page overview for the common folk, and the other will be a thorough guide for the technical people who will implement the system.

Final Thoughts

Your finished backup policy, which should be a great deal shorter than this article, serves two important purposes. First, it should guide the creation (or rehabilitation) of your backup system, ensuring that all the important factors are weighed before reaching specific hardware, software, or implementation decisions. And second, it tells everyone who uses your network exactly what to expect—from the technology and from you. Will their data, and their company, be safe in the event of a major catastrophe or a minor user error? Making sure that's true is the function of your backup system, and conveying a sense of confidence to your users is the function of your backup policy.

M

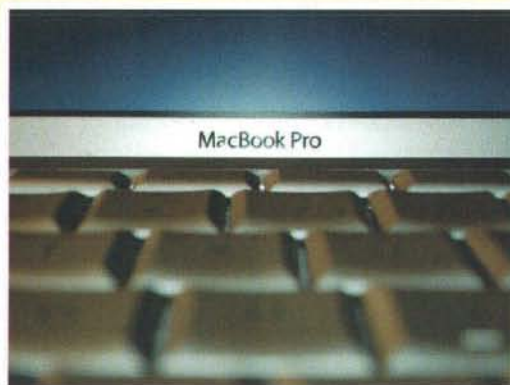
About The Author

Joe Kissell is Senior Editor of TidBITS, a frequent contributor to Macworld, and author of numerous books and ebooks about Mac OS X, including Take Control of Mac OS X Backups, Take Control of Easy Backups in Leopard, and Real World Mac Maintenance and Backups. You can reach him at jwk@mac.com.

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AppleScript and BBEdit

Extend and enhance your BBEdit experience with AppleScript

by José R.C. Cruz

Introduction

The BBEdit text editor is the flagship product of Bare Bones Software. It came onto the scene in 1992 as a better alternative over the anemic TeachText. Now, it's a popular editor for writing source code, HTML and XML files, and even regular text files. Its feature set includes support for more than 32K of text, regex search and replace, syntax coloring, and tag palettes. Its Mac OS X version can also support both AppleScript and shell scripts.

This article shows how you can use AppleScript to enhance your BBEdit setup. First, it provides a peek into BBEdit's scripting dictionary. Next, it introduces the BBEdit Script menu. Then it shows how to attach a script to any of BBEdit's menu items. The article also comes with examples of useful scripts.

The article assumes that you are familiar with the AppleScript language and the Script Editor. Also, its example scripts are all available from the MacTech site at the following URL: http://mactech.com/src/mactech/volume24_2008/24.08.sit

The BBEdit Dictionary

The BBEdit scripting dictionary (Figure 1) consists of eight AppleScript suites. The first three suites, (*grey*) define the methods and properties that most scriptable applications share. The **Required** suite defines those that all application must have. The **Standard** suite defines those that are common to most applications. And the **Miscellaneous** suite defines are those that an application may have.

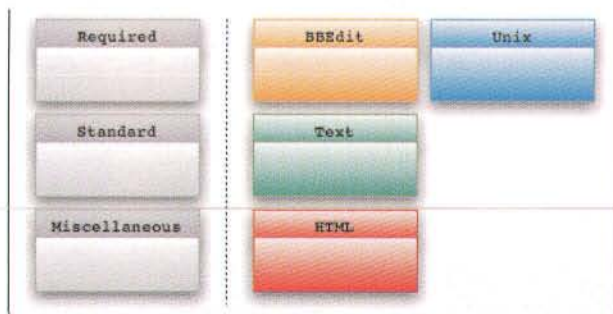


Figure 1. The BBEdit Scripting Dictionary

The remaining four suites (*colored*) are unique to BBEdit. Each suite defines the methods and properties needed for a specific task. To use any of these methods or properties, make sure to call them within a **tell...end tell** block, as follows.

```
tell application "BBEdit"
```

```
— call the BBEdit methods and properties here
```

```
end tell — application "BBEdit"
```

Covering all the methods and properties in detail is beyond this article's scope. Instead, this article will focus only on methods and properties used by its script examples.

The BBEdit suite

The BBEdit suite (*orange*) defines the methods and properties *common to all tasks*. Some will start and control a specific BBEdit feature. Others will access a specific BBEdit object.

For example, BBEdit 8.x displays its text files in two places: in a *window* or in a *drawer* (Figure 2). To access the front window, use the **text window** property.

```
tell application "BBEdit"
  get text window 1
end tell — application "BBEdit"
```

To access the second document in the drawer, e.g. **fubar.txt**, use the **text document** property.

```
tell application "BBEdit"
  get text document "fubar.txt"
end tell — application "BBEdit"
```

Next, you can read the text data in one of two ways. To retrieve the *entire text*, use the **contents** property.

```
tell application "BBEdit"
  get contents of text window 1
end tell — application "BBEdit"
```

To retrieve only the *selected text*, use the **selection** property.

```
tell application "BBEdit"
  get selection of text window 1 as text
```


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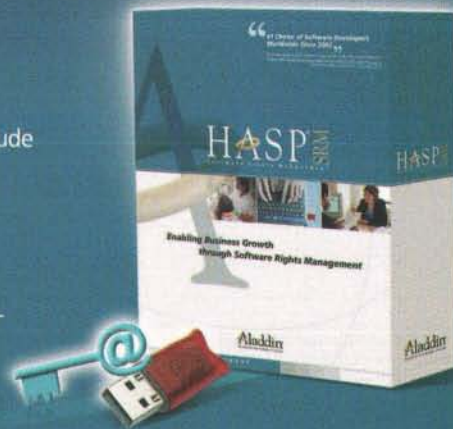
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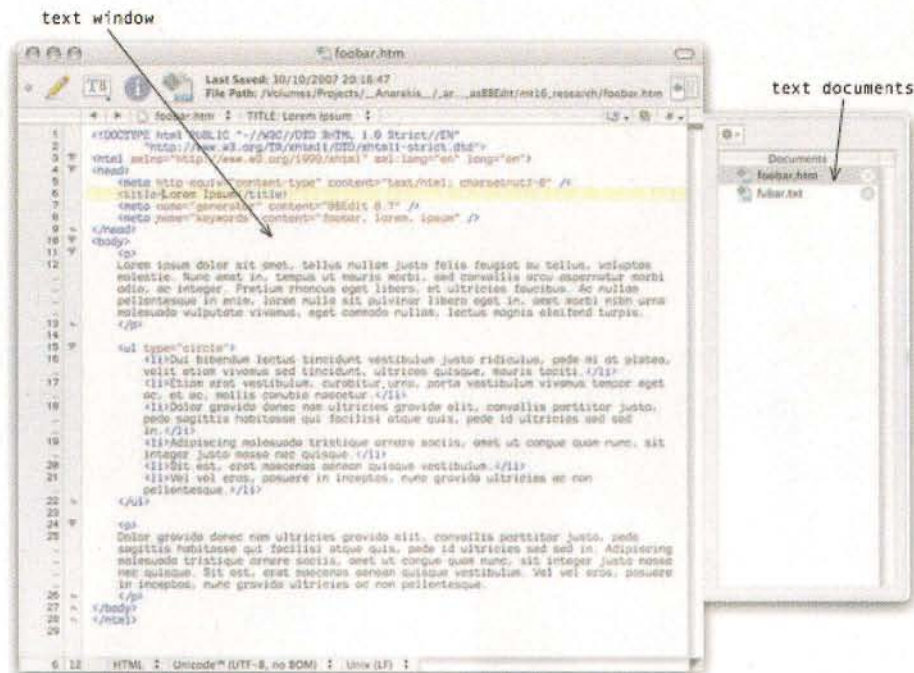


Figure 2. The BBEdit display views

```
end tell —application "BBEdit"
```

Notice that the above example forces the **selection** property to return its results as text. But if you remove the **as text** option, the property returns its results as *a range of characters*.

You can also use the same two properties to replace the data. For example, to *replace the entire text* to "Lorem ipsum dolor sit amet", use the **contents** property as follows.

```
tell application "BBEdit"
    set the contents of text window 1
        to "Lorem ipsum dolor sit amet"
    end tell —application "BBEdit"
```

To *replace only the selected text*, use the **selection** property as follows.

```
tell application "BBEdit"
    set the selection of text window 1
        to "Lorem ipsum dolor sit amet"
    end tell —application "BBEdit"
```

Finally, you can display other text data in a separate window. To do so, first use the **make** method to create a new text window. Then display the text "Lorem ipsum dolor sit amet" as follows.

```
tell application "BBEdit"
    make new text window
        with properties {contents:"Lorem ipsum dolor sit amet"}
    end tell —application "BBEdit"
```

The Text suite

The Text Suite (*green*) defines the properties that refer to *specific text elements*. Use them to read or change parts of the text data.

For example, to retrieve the third word on the front text window, use the **word** property.

```
tell application "BBEdit"
```

```
    get word 3 of text window 1
end tell —application "BBEdit"
```

To read the fifth word of the sixth line on that same window, include a **line** property.

```
tell application "BBEdit"
    get word 5 of line 6 of text window 1
end tell —application "BBEdit"
```

To read 10 words, starting at the *fifth* word, from the document **foobar.htm**, use the **word** property with a **thru** keyword.

```
tell application "BBEdit"
    get word 5 thru 15 of text document "foobar.htm"
end tell —application "BBEdit"
```

To change the fifth line of the front text window to "Lorem ipsum dolor", use the **line** property as follows.

```
tell application "BBEdit"
    set line 5 of text window 1 to "Lorem ipsum dolor"
end tell —application "BBEdit"
```

BBEdit defines words as those text elements that have only *letters, numbers, or both*. It treats spaces, punctuations, and other characters as *delimiters*. Consider the following line of sample text.

```
- 123 BBEdit property_1 ???
```

BBEdit sees only four words in the above line: **123**, **BBEdit**, **property**, and **1**. It sees the remaining elements as text delimiters.

The HTML suite

The HTML suite (*red*) defines the methods and properties used for web-related tasks. Some work on the HTML data displayed by the front text window. Others work on data stored on a file.

For example, to check the HTML data on the front window, use the **balance tags** method.

```
tell application "BBEdit"
    balance tags of text window 1
end tell —application "BBEdit"
```

BBEdit returns a **TRUE** if the HTML data is well formed; otherwise, it returns a **FALSE**. To check the data on the file **foobar.htm**, use the **check syntax** method.

```
set tPth to path to sites folder from user domain as string
set tPth to tPth & "foobar.htm"
tell application "BBEdit"
    check syntax of alias tPth show results true
end tell —application "BBEdit"
```

The above script assumes that the file is in the **Sites** subdirectory of the home directory. Also, BBEdit displays any errors it finds in a *separate window*.

The Unix suite

The Unix suite (*blue*) defines two methods for running a shell script from BBEdit. Make sure that the script starts with a valid **#!** header. Otherwise, it will either fail to run or terminate with an error.

Suppose you have the shell script **foo.sh** displayed on a BBEdit text window. To run the script, use to run **unix script** method.

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```
tell application "BBEdit"
    run unix script
end tell — application "BBEdit"
```

To run only the selected portion of that script, set the **selection only** option to **TRUE**.

```
tell application "BBEdit"
    run unix script selection only true
end tell — application "BBEdit"
```

To display the results of the script in a separate window, add an **output to** option as follows.

```
tell application "BBEdit"
    run unix script output to new untitled window
end tell — application "BBEdit"
```

To pass values to the script, first prepare the values as a *list*. Then pass the list to the script as follows.

```
set tArg to {"foobar", 24}
tell application "BBEdit"
    run unix script output to new untitled window
end tell — application "BBEdit"
```

The script reads the above values as positional parameters.

Now, suppose you have the script **foobar.sh** stored in your **Documents** directory. To run that script on the text in the front window, use the **run unix filter** method.

```
set tPth to path to documents folder from user domain as string
set tPth to tPth & "foobar.sh"
tell application "BBEdit"
    run unix filter alias tPth
end tell — application "BBEdit"
```

In the above example, BBEdition replaces the text with the output of the script. To save the script output in a *separate file*, set the **replacing selection** option to **FALSE**.

```
set tPth to path to documents folder from user domain as
```

```
string
set tPth to tPth & "foobar.sh"
tell application "BBEdit"
    run unix filter alias tPth replacing selection false
end tell — application "BBEdit"
```

Here, BBEdition saves the output in the file **Unix Script Output**. It also stores this file in the path **~/Application Support/BBEdit/Unix Support/**.

Running Scripts From BBEdition

You can run your AppleScript scripts from BBEdition's **Script** menu (Figure 3). For your scripts to appear in this menu, make sure to store them in the directory path **~/Application Support/BBEdit/Scripts**.

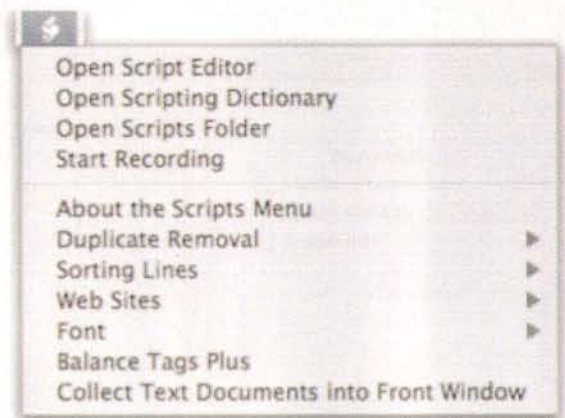


Figure 3. The BBEdition Script menu

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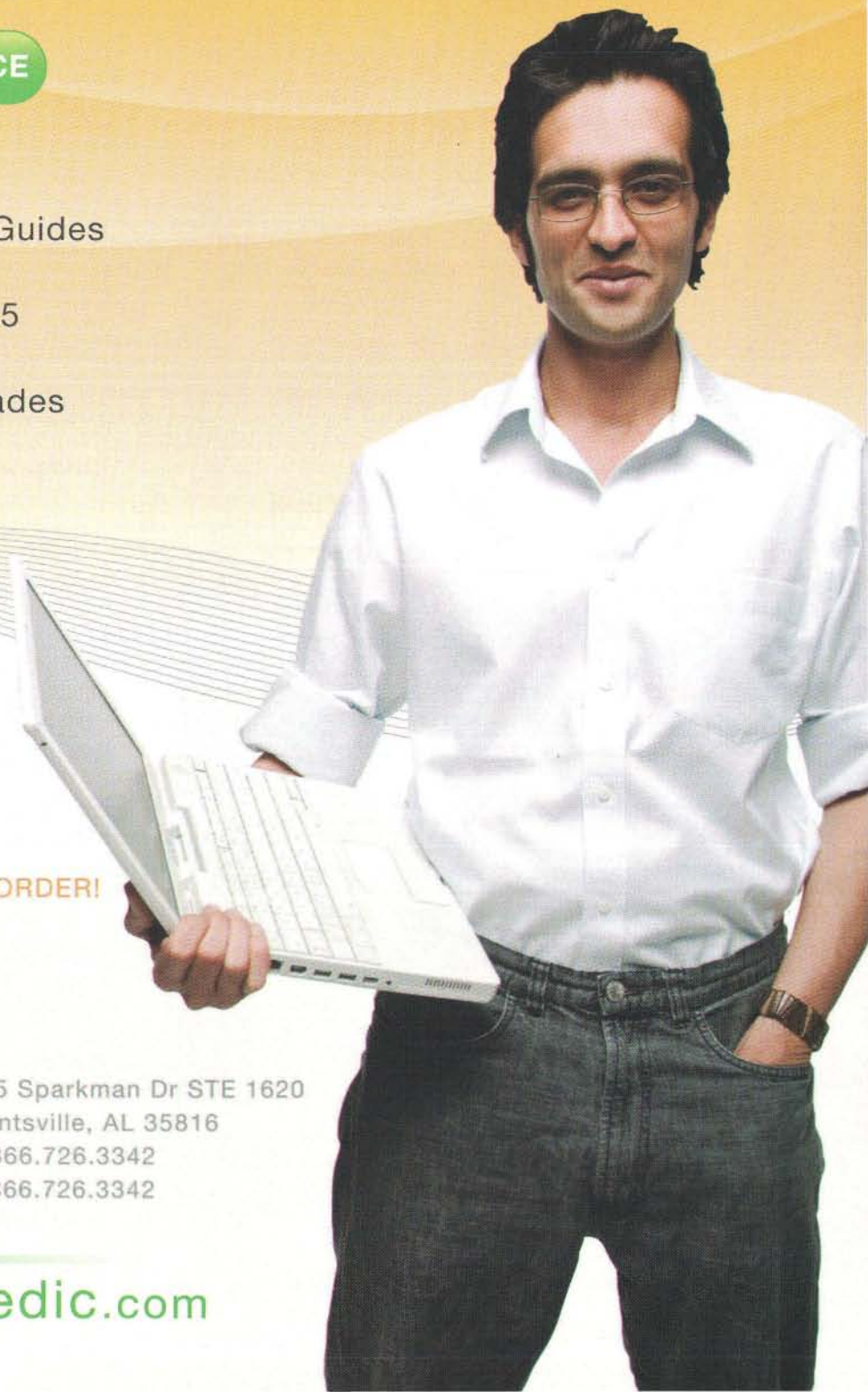
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You can also remove the **Script** menu if you have no need for it. To do so, first choose **Preferences** from the BBEdit menu. Click on the **Menus** entry to display its preferences panel. Then click on the checkbox **Scripts** to clear it (Figure 4). You should see the **Script** menu disappear from the menu bar.

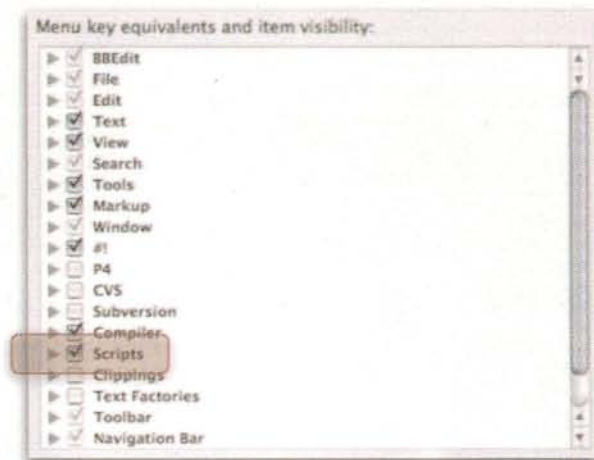


Figure 4. Disabling the Script menu

To restore the **Script** menu, follow the same steps to display the **Menus** preferences panel. Then click on the checkbox **Scripts** to set the option.

Using the menu

The **Script** menu gives you easy access to various scripting resources. For example, to launch the Apple Script Editor, choose the menu item **Open Script Editor** from the menu. To view BBEdit's scripting dictionary, choose the menu item **Open Scripting Dictionary**. To view the contents of the **Scripts** directory from the Finder, choose **Open Scripts Folder**.

The **Script** menu also lets you record your actions without leaving BBEdit. To begin the process, choose the menu item **Start Recording**. BBEdit will record your actions within and perhaps without.

To end the process, choose the menu item **Stop Recording**. BBEdit then prompts you for a filename for the script. Also, BBEdit saves the script in its **Script** directory by default. You can then use the **Script Editor** to open the script and make any changes you see fit.

Currently, BBEdit does not let you to choose a different script editor such as **Script Debugger**. This limitation may change in future versions of BBEdit. You can also override the **Open Script Editor** menu item using a *menu action script*.

Order of display

The **Script** menu lists the contents of its directory in *alphanumeric* order. If its directory has other subdirectories, the menu lists them in the same order as well.

You can, however, change the order in which each script or directory appears on the menu. All you have to do is to add a

numeric prefix to their names. Assume, for example, you have the following items in Figure 5. The Script menu displays these items as shown in Figure 6.

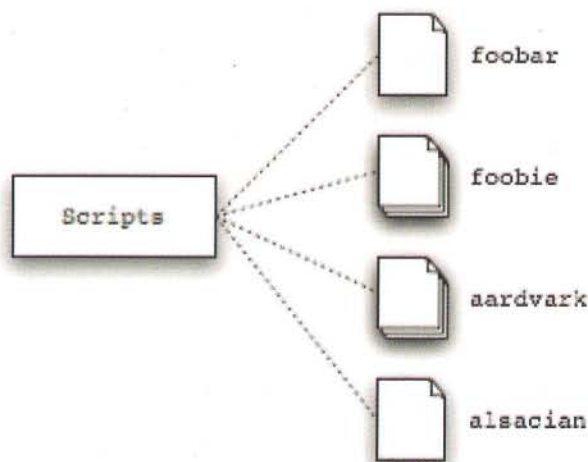


Figure 5. Contents of the Script directory



Figure 6. The Script menu before reordering

Now change the name of script `foobar` to `02)foobar`. Also, change the name of subdirectory `foobie` to `01)foobie`. The Script menu will now reorder these items as shown in Figure 7. Notice that the menu excludes the number prefix added to the two names.



Figure 7. The Script menu after reordering

Example menu scripts

The following are three examples of scripts for the BBEdit Script menu. They operate on any text selected on the front text window. For reasons of length, some examples show only the main parts of the script. You can always download the examples from the MacTech website if you want to see the entire scripts.

Feel free to modify these scripts to suit your needs.

The script in Listing 1 is a very simple one. This script encodes the selected text using a ROT-13 algorithm. It then displays the encoded result in a separate window. It also sets the title of the output window to that of the source window plus a `.rot13` suffix.

Listing 1. The menu script Encode in ROT-13

```
on run
    local tTxt, tDoc

    tell application "BBEdit"
        — retrieve the selected text
        set tTxt to the selection of text window 1
        set tTxt to tTxt as text

        — retrieve the document title
        set tDoc to name of text window 1
    end tell — application "BBEdit"

    — validate the selection
    if (length of tTxt is 0) then
        display alert "Script Error" message "You have not selected a text to be encoded" as informational
    else
        — rotate the selection
        set tTxt to rotate given target:tTxt

        — modify the file name
        set tDoc to appendRot13 for tDoc

        tell application "BBEdit"
            — create a new text window
            make new text window
            set name of text window 1 to tDoc

            — display the rotated text
            set the text of text window 1 to tTxt
            activate
        end tell
    end if
end run
```

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```

        end tell — application "BBEdit"
    end if
end run

property kABC : "abcdefghijklmnopqrstuvwxyz"
property kNOP : "nopqrstuvwxyzabcdefghijklm"

— Attach the ROT-13 suffix
to appendRot13 for aNom
    local tOld, tMod, tSuf

    — set the text item delimiters
    set tOld to text item delimiters of AppleScript
    set text item delimiters of AppleScript to "."

    — dissect the filename
    set tMod to text item 1 of aNom
    set tSuf to text item 2 of aNom

    — modify the filename
    set tMod to tMod & "-rot13."
    set tMod to tMod & tSuf

    — restore the text item delimiters
    set text item delimiters of AppleScript to tOld

    — return the modified name
    return (tMod)
end appendRot13 — for aNom

— Subject the text to a ROT-13 algorithm
to rotate given target:aTxt
    local tPos, tChr, tLst
    local tRot

    — disassemble the target text into its characters
    set tRot to ""
    set tLst to characters of aTxt

    repeat with tChr in tLst
        — check against the stream of lower-case
characters
        set tPos to offset of tChr in kABC
        if (tPos > 0) then
            set tRot to tRot & (character tPos of kNOP)
        else
            set tRot to tRot & tChr
        end if — (tPos > 0)
    end repeat — with tChr in tLst

    — return the rotated text
    return (tRot)
end rotate — given target:aTxt

```

The script in Listing 2 is a bit more complex. First, it reads the selected text from the front text window. It then prompts the user for the recipient's e-mail address and for a message title. Next, the script asks the user to choose which e-mail account to use. Then it uses Apple Mail to prepare a draft e-mail message containing the selected text.

Listing 2. The menu script E-Mail Selection

```

on run
    local tTxt, tRcv, tSnd

    — retrieve the selected text
    tell application "BBEdit"
        set tTxt to the selection of text window 1
        set tTxt to tTxt as text
    end tell — application "BBEdit"

    — validate the selection
    if (length of tTxt is 0) then

```

```

        display alert "
        "Script Error" message "
        "You have not selected a text to be mailed" as
informational
    else
        — get the recipient details
        set tRcv to askForReceiver()

        — get the account details
        set tSnd to askForAccount()

        — send the selection
        if (tSnd is false) then
            — DO NOTHING HERE
            beep
        else
            sendMail for tTxt from tSnd to tRcv
        end if
    end if
end run

```

— Send the text

— NOTE:

— The following script is a modified version of Apple's sample script

```

to sendMail for aTxt from aSnd to aRcx
    local tMsg, tSub, tRcx

```

— retrieve the following recipient data

```

set tSub to subject of aRcx
set tRcx to recipient of aRcx

```

— activate Apple Mail

```

tell application "Mail"
    activate

```

— create a new outgoing message

```

set tMsg to make new outgoing message
set content of tMsg to aTxt & return & return
set subject of tMsg to tSub
set sender of tMsg to item 1 of aSnd

```

```

tell tMsg

```

```

    set visible to true

```

```

    make new to recipient at end of to recipients "
        with properties {address:tRcx}

```

```

end tell — tMsg

```

```

end tell — application "Mail"

```

```

end sendMail — for aTxt from aSnd to aRcx

```

```

.
.
.

```

The script in Listing 3 is much more interesting. First, the script counts the number of words and lines in the selected text. Then it counts the number of syllables in each word. Next, it calculates the text's readability index and grade using the Flesch-Kincaid formula. It then displays the results in a dialog window.

To keep things simple, this script approximates the syllable count as the *number of vowels in each word*.

Listing 3. The menu script Flesch-Kincaid Index

```

on run
    local tStat, tTxt, tWrd

    — retrieve the selected text
    tell application "BBEdit"
        set tTxt to the selection of text window 1
        set tTxt to tTxt as text
    end tell — application "BBEdit"

```



```

— validate the selection
if (length of tTxt is 0) then
    display alert ~
        "Script Error" message ~
        "You have not selected a text for analysis" as
informational
else
    — count the number of words in the target text
    set tStat to readabilityStats from tTxt

    — display the results
    set tTxt to "Ease Index: "
    set tTxt to tTxt & (index of tStat as string)
    set tTxt to tTxt & (ASCII character (13))
    set tTxt to tTxt & "Grade Level: "
    set tTxt to tTxt & (grade of tStat as string)

    display dialog tTxt buttons ["OK"] ~
        with title ~
        "Flesch-Kincaid Readability" default button 1 ~
        giving up after 10
end if
end run

— Determine the readability statistics of the target text
on readabilityStats from aTxt
    local tStat, tWrds, tFKI, tFKG
    local tAWL, tASW

    — initialize the statistics results
    set tStat to {sentences:0, wordCount:0, syllables:0,
index:0, grade:0}

    — calculate the following
    — readability:count:sentences
    set sentences of tStat to numberOfLines from aTxt

```

```

— readability:count:words
set tWrds to numberOfWords from aTxt
set wordCount of tStat to wordCount of tWrds

— readability:count syllables
set tWrds to wordList of tWrds
set syllables of tStat to numberOfSyllables from tWrds

try
    — calculate the following averages
    set tAWL to ((wordCount of tStat) / (sentences of
tStat))
    set tASW to ((syllables of tStat) / (wordCount of
tStat))

    — calculate the Fleisch-Kincaid ease index
    set tFKI to 206.835 - 1.015 * tAWL - 84.6 * tASW
    set index of tStat to tFKI

    — calculate the Fleisch-Kincaid grade level
    set tFKG to 0.39 * tAWL + 11.8 * tASW - 15.59
    set grade of tStat to round (tFKG)
on error
    set index of tStat to 0
    set grade of tStat to 0
end try

— return the statistics results
return (tStat)
end readabilityStats — from aTxt
.
.
.

```

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Attaching Scripts To BBEdit

Another way to run scripts on BBEdit is to attach them to a menu item. Known as *menu action scripts*, they can run before or after the selected menu action. They can enhance the original action or replace it entirely. Menu action scripts are stored in the following directory.

~/Library/Application Support/BBEdit/Menu Scripts.

Also, only version 6.0, or newer, of the BBEdit application supports this type of scripts.

Anatomy of the script

Menu action scripts come in three forms. The first form (Figure 8) has a standard `on run` handler. When a user selects a menu item, the script runs the handler *right after the selection*. It then prevents the original menu action from running.

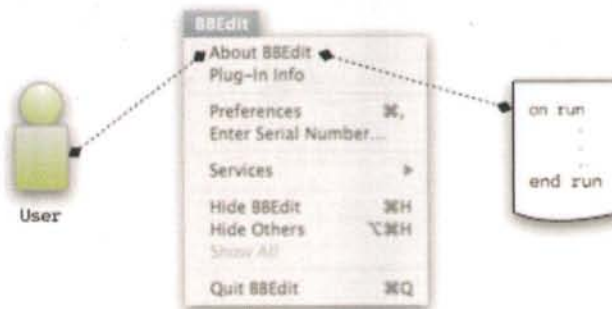


Figure 8. Overriding a menu item action

The second form (Figure 9) has an `on menuselect` handler. When a user selects a menu item, the script runs the handler *before the original action*. The handler then returns a Boolean value, which tells the script what to do next. If the handler returns a `FALSE`, the script allows the original menu action to run. If it returns a `TRUE`, the script comes to an end.

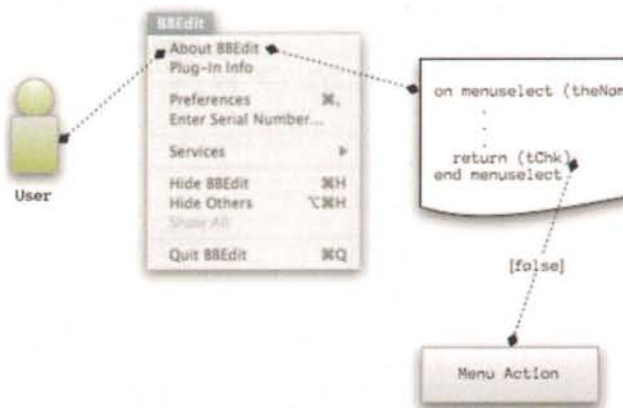


Figure 9. Preceding a menu item action

The third form (Figure 10) has two handlers: an `on menuselect` and an `on postmenuselect`. When a user

selects a menu item, the script first runs the `on menuselect` handler. If this handler returns a `TRUE`, the script stops, preventing the original menu action to run. But if the handler returns a `FALSE`, the script lets the original action to run. Then it runs the `on postmenuselect` handler.

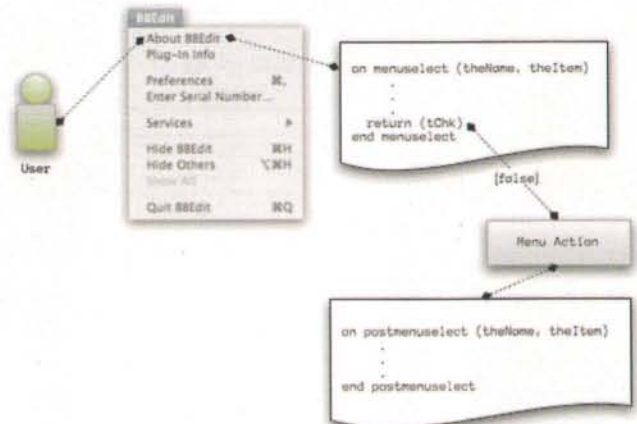


Figure 10. Enclosing a menu item action

To attach a menu action script to a menu item, you need to name the script in a certain way. The following is the syntax you should use for the script's name.

`menu • menu_item`

The *menu* string is the name of the menu on the menubar. It can also be the name of the hierarchical menu as well. The *menu_item* string is the name of menu item itself. For example, to attach a script to the menu item **About BBEdit**, use the following name for the script.

`BBEdit • About BBEdit`

To attach a script to the menu item **Save As...**, use the following name.

`File • Save As...`

Make sure to separate the two strings with a `•` character. If the menu item contains an *ellipsis*, make sure to include that as well. Otherwise, BBEdit will not recognize the script.

Example menu action scripts

The following are three examples of menu action scripts for BBEdit. These examples require version 8.x or newer of BBEdit. Feel free to modify these scripts to suit your needs.

Again, for reasons of length, some examples show only the main parts of the script. To see the scripts in their entirety, download the examples from the MacTech website.

The script in Listing 4 overrides the **Make Backup Now...** menu item in the **File** menu. First, this script gets the file name and path of the displayed text document. It then prepares the name of the backup tarball using the file's name. Next, it sets the backup path to the directory `~/Documents/Backup`. Then it creates the backup tarball in that directory.

Listing 4. The menu action script

File•Make Backup Now...

```
on menuselect(aMenu, anItem)
    local tDoc, tBck

    — retrieve the document information
    set tDoc to pathOfDocument()
    set tBck to backupName for (dnom of tDoc)
    set tDoc to (dpth of tDoc)

    — backup the document
    tell me to storeBackup for tDoc at tBck
end menuselect

— Create the tarball backup
on storeBackup for aDoc at aTar
    local tNew, tCmd, tBck

    — prepare the tarball backup
    set tBck to pathToBackup()
    set tBck to tBck & aTar

    — does the tarball already exists?
    set tNew to pathExists for tBck

    — prepare the tar command
    set tCmd to "tar -file=" & (POSIX path of tBck)
    set tCmd to tCmd & " -label=bbedit_backup"

    if (tNew) then
        — backup:file:create
        set tCmd to tCmd & " -create "
    else
        — backup:file:update
        set tCmd to tCmd & " -update "
    end if —(tNew)
```

```
set tCmd to tCmd & (POSIX path of aDoc)

try
    — execute the backup command
    do shell script tCmd

    — inform the user
    if (tNew) then
        set tBck to "Created the tarball backup at:" &
        & return & tBck
    else
        set tBck to "Updated the tarball backup at:" &
        & return & tBck
    end if —(tNew)

    display dialog tBck with title "
    Successful Backup" giving up after 5 "
    buttons {"OK"} default button 1

on error tErr
    display alert "
    Backup Error" message "
    (tErr as string) as critical
end try

end storeBackup — for aDoc at aTar
```

The script in Listing 5 overrides the Find Differences... menu item, which is under the Search menu. This script first gets the file path to the displayed text document. It then asks the user to choose a second file to compare against. Next, the script

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compares the two files using the command-line tool `diff`. Then it displays the results on a separate text window.

Listing 5. The menu action script Search•Find Differences...

```
on run
    local tDoc, tRef, tDiff

    — get the frontmost document
    set tDoc to frontDocument()

    — get the document directory
    set tDoc to docInfo for tDoc
    if (tDoc is not false) then
        set tRef to selectTarget for tDoc
        set tDiff to getDifferences for tRef against (dpth of
tDoc)

    — display the differences
    tell application "BBEdit"
        — create a new text window
        make new text window
        set name of text window 1 to "Diff results"

        — display the results
        set the text of text window 1 to tDiff
        activate
    end tell — application "BBEdit"
    end if — (tDoc is not false)
end run

— Get the frontmost document
on frontDocument()
    local tDoc, tPth
```

```
    tell application "BBEdit"
        set tDoc to text window 1
        set tPth to the file of tDoc
    end tell — application "BBEdit"

    — return the retrieval results
    return (tPth)
end frontDocument

— Display the differences between the two files
on getDifferences for aDoc against aRef
    local tCmd, tDiff

    — prepare the diff command
    set tCmd to "diff -ignore-all-space"
    set tCmd to tCmd & " -text"
    set tCmd to tCmd & " -suppress-common-lines"
    set tCmd to tCmd & " " & (POSIX path of aRef)
    set tCmd to tCmd & " " & (POSIX path of aDoc)

    — execute the command
    try
        do shell script tCmd
        set tDiff to result
    on error tErr
        set tDiff to tErr as string
    end try

    — return the comparison results
    return (tDiff)
end getDifferences — for aDoc against aRef
.
```

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The script in Listing 6 overrides the **Folder Listing...** menu item. This menu item is in the hierarchical menu **Insert**, which is under the **Edit** menu. First, the script asks the user to choose a directory. It lists the contents of that directory using the **ls** command-line tool. Then it displays the results on the front text window.

Listing 6. The menu action script Insert•Folder Listing...

```
on run
    local tDir, tLst

    — ask for the target directory
    set tDir to askForTarget()

    — get a list of contents from that directory
    set tLst to listContents from tDir

    — display the results
    set tDir to "Contents of the directory:" & return & tab ~
        & (POSIX path of tDir)
    set tLst to tDir & return & tLst
    tell application "BBEdit"
        set selection of text window 1 to tLst
    end tell — application "BBEdit"
end run

— Display the contents of the target directory
on listContents from aTgt
    local tLst, tCmd

    — set the shell command
    set tCmd to "ls -ASl " & (POSIX path of aTgt)
```

```
— execute the command
try
    do shell script tCmd
    set tLst to result
on error
    set tLst to "Unable to list the contents of the
target:" & return
    set tLst to tLst & (aTgt as string)
end try

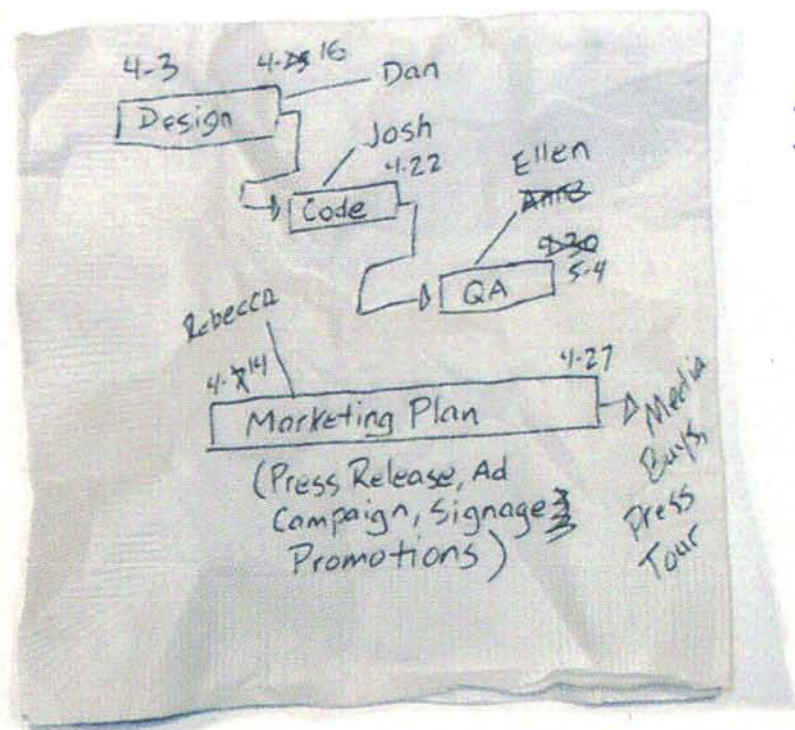
— return the retrieval results
return (tLst)
end listContents — from aTgt

— Ask the user for a target directory
on askForTarget()
    local tPth

    — set the default directory
    set tPth to path to documents folder from user domain

    — prompt the user for a target directory
    choose folder ~
        "Select which directory to peruse" default location
    tPth
    set tPth to result

    — return the selection
    return (tPth)
end askForTarget
```



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Final Remarks

BBEdit has a strong and impressive support for AppleScript. It gives you a scripting dictionary with an extensive set of properties and methods. It allows you easy access to various scripts and script resources. It lets you record your actions on demand and save the results to a file. It even lets you attach scripts to specific menu events.

Because of its level of support, BBEdit continues to stand out against other text editors. It is also a prime example of what a scriptable application should be.

Bibliography and References

Borenstein, Philip, Stephen Chernicoff, et al. "Using AppleScripts in BBEdit". *BBEdit™ 8.5 User Manual*, pp. 277-281. Copyright 1992-2006. Bare Bones Software Inc. Apple. *AppleScript Language Guide*. Copyright 1999. Apple, Inc.

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About The Author

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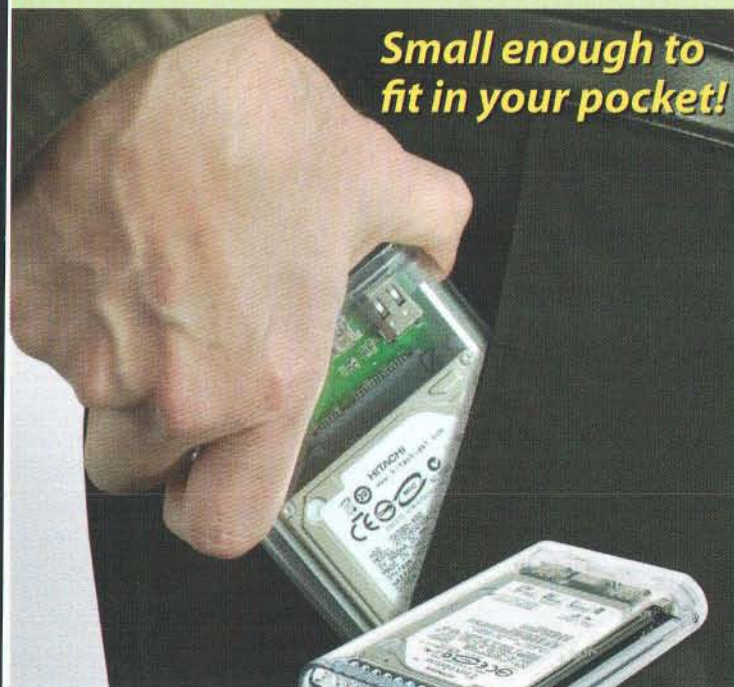
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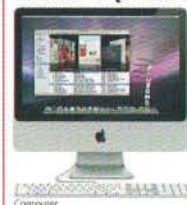
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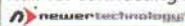
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SNMP Primer for OSX Leopard

An article on "Understanding, Configuring, and Customizing SNMP on OS X Leopard" that might change the way you think about your Mac.

by Noah Giff

Introduction

If you haven't done any work with SNMP before, you might be thinking, "who cares?" SNMP has gotten the somewhat deserved reputation as being complex to administer and understand. As a result, many people don't care, and there are not that many articles that talk about it.

This article will attempt to present the information in a gentle enough manner that no experience with SNMP will be required. At the same time, we will dive into a few obscure, but absolutely fascinating things that be done with SNMP that few delve into. It is quite fun to let a cat out of the bag, so let's dive into SNMP and see how it might just change the way you think about your Mac.

Backwards First

Because SNMP can be incredibly boring to talk about, let's save the obligatory overview of what SNMP is, the history of SNMP, configuring SNMP etc. Instead we are going to immediately do something useful. Just follow these steps on a OS X Leopard machine that is not a production server.

```
Step 1: cp /etc/snmp/snmpd.conf
/etc/snmp/snmpd.conf.bak.052108
Step 2: echo "rocommunity public" > /etc/snmp/snmpd.conf
Step 3: Restart the snmpd daemon by simply typing the
executable:
mini# snmpd
Step 4: Query the disk usage of your machine via snmp:
```

```
mini# snmpdf -v 2c -c public localhost
Description      size (kB)    Used    Available    Used%
Physical memory   1310720      821440   489280       62%
Swap space        65532        0        65532        0%
/                 77814832    51153396 26661436     65%
/dev              1            1         0           100%
/dev              1            1         0           100%
/net              0            0         0            0%
/home             0            0         0            0%
```

Hopefully these simple four steps did the equivalent of dropping a suitcase nuke on your preconceptions about SNMP. Let's now go over what we did in detail now. In the first step we simply made a backup of the snmp configuration file, and added a date stamp on it.

In the second step we overwrote the whole snmpd.conf file by simply echoing out one line of configuration syntax; this effectively erases pages upon pages of almost completely useless configuration data you will never use. This in fact is one of the biggest stumbling blocks to understanding new technology, too much information.

In the third step we told snmpd to start the daemon so we can query it. (We will get into launchd configurations later). Finally in the fourth step, we ran a specialized snmp tool that is effectively the same as running df -k on a local machine.

Backwards First Explained

Now that we have removed some of the magic behind SNMP, and brought it down to the level of complexity of ssh or tar let's fill in a few of the details. The very first detail to understand is the cryptic syntax for the snmpdf command. If we look at the command again, we can break it down into the following sections:

```
snmpdf -v [SNMP Version] -c [Name of community string] IP
Address or hostname
```

Fortunately, all of the Net-SNMP command line tools follow this same syntax, so you will only need to understand one tool to understand the rest. The -v option refers to which version of SNMP you wish to use. The available options are 1, 2c, and 3. Versions 1 and 2c are not encrypted so they are only safe to use in a secure firewalled environment, and version 3 requires more explanation and setup. If you just want to setup snmp at home behind a firewall, then 2c is the version you will most likely want to use.

The next flag -c refers to the community string. With SNMP versions 1 and 2c, the authentication system revolves around setting community strings to grant access to the snmp daemon. There are ways to set community strings to allow read access, which is what we did in the section above, and also to allow read/write access. In this case, we went with a convention and used public as the ro, or read only community string.

Patrick Emerson

From: Patrick Emerson [pemerson@yourc
Sent: Tuesday, March 11, 2008 1:38 PM
To: Michael Allen
Subject: Moving to a Subscription Based Sales Model

Mike,

I've run the numbers and I really think we should recommend a subscription model to Steve. With our product, it's a financial win and now allows us to easily monetize our support services. Add in the fact our customers will benefit with more choice on how to purchase our product...it's a no-brainer.

Thoughts?

- Patrick

----- Michael Allen Replied -----

From: Michael Allen [mallen@yourcompany.com]
Sent: Tuesday, March 11, 2008 1:42 PM
To: Patrick Emerson
Subject: Re: Moving to a Subscription Based Sales Model

Patrick,

Yes, I agree it makes great financial sense. Here's the thing, we have to build it. This means new code in our product, new UI in our store, and managing end-user's in a whole new way. Not to mention, the compliance, legal and financial complications we will now have. Don't we also have to address all new requirements and security concerns when we save personal information and recharge someone's credit card?

I'm not sure we have the time or resources for all of that or even fully understand it. Still, I would hate to let this slide.

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Finally, we just typed in the name of the local machine. We could have typed in the name of any machine on the internet though, if they had snmp running and had the configuration we setup. This is really almost 80% of what someone needs to know about SNMP, we will cover a few of other things later. Given that we are now SNMP experts, let's write some code to monitor a home network for disk usage problems.

Writing a Disk Space Monitoring System in Python

Since we are now SNMP experts, and have bragged to all of our friends how we can monitor the disk usage of our machines remotely, we got thrown into a consulting gig "by accident." Our task is to write a simple nightly monitoring script that checks all of the machines on a local network to make sure they do not have critical disk space issues. This client has several Final Cut Pro Suites where the editors constantly overfill their RAID volumes, and it is our job to write code that will prevent it before it happens and send the company owner an email when disk space on any volume exceeds 80%.

With Python and SNMP this is actually a trivial, yet very useful, problem to solve. The first step is to write some code that flags disk usage that exceeds 80%.

Listing 1: snmpdf_alert.py

```
#!/usr/bin/env python
""" Parses the output of snmpdf and performs a regular
expression match that searches for 80-99% disk usage
pattern. If a match is found it prints out the volume that
exceeds our "quota"."""

from subprocess import PIPE, Popen
import re

def snmpdf(machine):
    """Returns snmpdf output as file object"""

    p = Popen("snmpdf -v 2c -c public %s" % machine,
              shell=True,
              stdout=PIPE,
              stderr=PIPE)
    return p.stdout

def parse(file):
    """Parses file object and determines if critical match
between 80-99% disk usage is met.
Returns collected results with new stamp line."""

    collection = []
    pattern = "[8-9][0-9]%"
    outline = (line.split() for line in file)
    flag = (" ".join(row) for row in outline \
            if re.search(pattern, row[-1]))
    for line in flag:
        newline = "%s DISK USAGE CRITICAL" % line
        collection.append(newline)
    if len(collection) > 0:
        return collection

if __name__ == "__main__":
    #prints results
    out = snmpdf("localhost")
    result = parse(out)
```

```
if result:
    for line in result:
        print line
```

All this script does is to take the results from the snmpdf command and look for volumes that have between 80-99 % utilization. If you are dealing with editing on a local RAID volume, often exceeding 80% capacity will cause performance problems. If we run this script on a machine with utilization problems, we get something that looks like this:

```
mini# python2.5 snmpdf_alert.py
/ 97349872 88678460 8671412 91% DISK USAGE CRITICAL
```

We can see that this machine's root volume or "/", is at 91% capacity. This is obviously a big problem that we need to address very soon.

In order to turn this into something that manages a network and emails a warning, it would be fairly easy to just run this in a cron job or via launchd, and mail an alert message if the output of the script was not None, which is what happens when there is no match for our regular expression.

If you are new to Python some of the code may look a little weird, so here are a few things to remember. First, whitespace is significant, so indentations are there to control the flow of the program. Second, if you are coming from another language, Python is fairly easy to pick up. If you would like a reasonable introduction to the language please refer to tutorial listed in references.

Getting Closer to 80% Knowledge of SNMP

There are few things we glossed over in the first parts of the article because they were boring, but let's get them out of the way. This should bring you a bit closer, if not all the way, to knowing 80% SNMP. First, in order to get the SNMP daemon to run upon startup you will need to modify the plist for:

```
/System/Library/LaunchDaemons/org.net-snmp.snmpd.plist
```

And make it look as follows:

Listing 2: /System/Library/LaunchDaemons/org.net-snmp.snmpd.plist

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE plist PUBLIC "-//Apple//DTD PLIST 1.0//EN"
"http://www.apple.com/DTDs/PropertyList-1.0.dtd">
<plist version="1.0">
<dict>
    <key>Disabled</key>
    <false/>
    <key>KeepAlive</key>
    <true/>
    <key>Label</key>
    <string>org.net-snmp.snmpd</string>
    <key>OnDemand</key>
    <false/>
    <key>Program</key>
    <string>/usr/sbin/snmpd</string>
    <key>ProgramArguments</key>
```



```

<array>
  <string>snmpd</string>
  <string>-f</string>
</array>
<key>RunAtLoad</key>
<true/>
<key>ServiceIPC</key>
<false/>
</dict>
</plist>

```

What this does is to tell the snmpd daemon to start up upon reboot and then stay alive. Arguably, this could be set to OnDemand instead, but this is one of the newer features of launchd and it hasn't been fully tested with snmp much.

Next, we need to talk a little bit about the snmpwalk command, OIDs, and MIBs. The very short explanation of an OID is that it is a string of numbers, with a human readable name, that lives inside of a MIB file. This whole system is a hierarchically-assigned namespace for the SNMP protocol to keep track of what an agent can provide when you query it.

Let's take a look at how the snmpwalk command is used to shed some light on this. Here is a basic snmp query of our local machine again using the OID sysdescr:

```
mini# snmpwalk -v 2c -c public localhost sysdescr
```

```

SNMPv2-MIB::sysDescr.0 = STRING: Darwin mini.local 9.2.2
Darwin Kernel Version 9.2.2: Tue Mar  4 21:17:34 PST
2008; root:xnu-1228.4.31~1/RELEASE_I386 i386

```

By examining the command we ran you may notice the syntax is identical to the syntax of the snmpdf command, with the exception of the word sysdescr. This word is an OID, and it lives in the MIB-2 file. You can refer to the references for an actual breakdown of this OID and where it lives in the larger MIB structure if you are curious, but if you just want to use SNMP you only need to know important OID's to query.

As our last mention of this topic, it is important to know that the snmpwalk command retrieves all of the OIDs that are listed below it in the hierarchical structure. To get the superset of the OID that holds sysdescr, we could type in this:

```

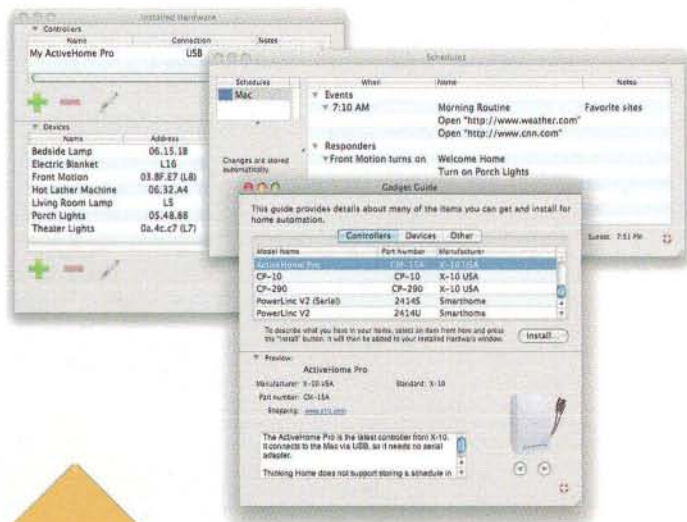
mini# snmpwalk -v 2c -c public localhost system
SNMPv2-MIB::sysDescr.0 = STRING: Darwin mini.local 9.2.2
Darwin Kernel Version 9.2.2: Tue Mar  4 21:17:34 PST
2008; root:xnu-1228.4.31~1/RELEASE_I386 i386
SNMPv2-MIB::sysObjectID.0 = OID: NET-SNMP-
MIB::netSnmpAgentOIDs.255
DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (1892500)
5:15:25.00
[OUTPUT SHORTENED FOR SPACE]

```

This gives us not only the sysdescr OID, but many others as well. For writing a monitoring system you almost never query something in this manner though, you typically just find out the important lower level OIDs, and then write some scripts using them.

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This is all we are going to cover about the very nitty gritty details about how SNMP is implemented. If you are curious, you do a Google search for these terms and you should get all of the reference material you need.

A Final Trick: Extending the Net-SNMP Agent with Python and OSAScript

At this point we have the basics covered for configuring, configuring, scripting, and querying SNMP on the Mac. As a final trick, we are going to extend the Net-SNMP agent on our Mac and do something fun.

We are going to write a script that tells iTunes to start up and play something on "Party Shuffle" if we query a specific OID. In order to do that we need double our already massive configuration file, or add one more line. Let's make our /etc/snmp/snmpd.conf look like this:

```
rocommunity public
exec PlayItunes /usr/bin/python /tmp/playitunes.py
```

Next, we need to write that script so that it executes when we run. Here is what that script looks like:

Listing 3: playitunes.py

```
#!/usr/bin/env python

from subprocess import Popen, PIPE

cmd = """osascript<<END
tell application "iTunes"
play playlist "Party Shuffle"
end tell
END"""

def play_iTunes():
    Popen(cmd, shell=True, stdout=PIPE, stderr=PIPE)
    print "Started iTunes Party Shuffle"

play_iTunes()
```

Next we need to send the snmpd daemon a HUP to tell it to reread it's configuration file. Do a `ps -ef | grep snmpd` and then give the PID a `kill -1`. This is what it looks like when I do it:

```
mini# ps -ef | grep snmpd
0 26 1 0 0:01.82 ?? 0:02.26
snmpd -f
0 515 355 0 0:00.00 ttys000 0:00.00 grep
snmpd
mini# kill -1 26
```

Finally, we are ready to "query" our machine and make it trigger our custom script. There is a standard OID that responds to custom scripts and it is used in the `snmpwalk` call below:

```
mini# snmpwalk -v 2c -c public localhost
.1.3.6.1.4.1.2021.8
UCD-SNMP-MIB::extIndex.1 = INTEGER: 1
```



```
UCD-SNMP-MIB::extNames.1 = STRING: PlayItunes
UCD-SNMP-MIB::extCommand.1 = STRING: /usr/bin/python
UCD-SNMP-MIB::extResult.1 = INTEGER: 0
UCD-SNMP-MIB::extOutput.1 = STRING: Started iTunes Party
Shuffle
UCD-SNMP-MIB::extErrFix.1 = INTEGER: noError(0)
UCD-SNMP-MIB::extErrFixCmd.1 = STRING:
```

When we run the command, and see the output, we can see the print statement that we included with our script. If we actually take a look at our machine, we will notice that iTunes indeed pops up, and starts on Party Shuffle.

This is a slightly silly example for extending a Net-SNMP agent, but if you are a home power user, maybe it isn't. Who doesn't want to brag and tell your spouse, you turned on iTunes via SNMP to the downstairs computer?

Conclusion

We covered a lot of ground in this article, and hopefully got you to understand how SNMP might be useful in your computing ecosystem. There were quite a few things we glossed over, mostly the boring stuff, but they aren't entirely necessary for you to start hacking around with SNMP.

We covered about 80% of the most important material, and I will leave the remaining 20% for you to pick up on your own. If you do plan on learning more about SNMP theory it would make sense to read a book or two on the subject or read a few articles on Wikipedia on SNMP. For casual use of SNMP though, you have more than your fair share to explore with the ideas from this article.

One final word of caution though is to make sure that you only use SNMP version 1, and 2 if you are communicating on a secure LAN behind a firewall. There have been some high profile break-ins of machines that have occurred by using insecure versions of SNMP over the internet. If you do need to remotely query or a control a machine across a the internet you must use SNMP v3 to be secure.

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About The Author

Noah Gift has been a Mac user since his family bought a Macintosh Performa 6300 in 1992, and started connected to BBS networks immediately and then eventually the World Wide Web in 1993 when it become open to the public. He is the co-author of Python For Unix and Linux Systems Administration by O'Reilly.

Noah has a couple of decades of experience in the Television and Film industry starting off as an editor for ABC Network News as a teenager. He contributed to the first feature animated film for Disney Feature Animation and Sony Imageworks. He also had stints at Turner Studios and Caltech, where he worked for the Nobel Prize-winning President as a Mac expert. He has a Master's degree in CIS, and is LPI and ACSA certified. He also organizes PyAtl, the local Python programmers user group in Atlanta.

Currently Noah is consultant, writer and speaker, specializing in OS X/Unix, Linux, Python, and Web development for his company, Giftcs, www.giftcs.com. Many of his projects and writing are available at www.noahgift.com. He can be contacted at noah.gift@giftcs.com

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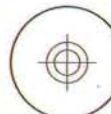
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THE ROAD TO CODE

by Dave Dribin

Patterns in the Sky

The Model-View-Controller Design Pattern

Welcome Back

We've come a long way since the first *Road to Code*. We've covered Foundation and AppKit, the basic frameworks of Mac OS X, and we can write GUI applications. While we've covered the Objective-C language and classes that make up an application, we've glossed over a bit of history. How did Mac OS X applications evolve the way they have? Why did Apple's (and NeXT's) engineers create classes like `NSApplication`, `NSView`, and `NSControl`? The search for these answers takes us down a path the computing history.

Design Patterns

Ever since the dawn of computing, programmers have been trying to make their lives easier and more productive. Today we take high-level languages like Objective-C, C++, Java, Ruby, and Python for granted. Back in the day, programmers had to code in assembly language directly. Grace Hopper wrote the very first compiler in the 1950s to alleviate the pain of writing assembly language. In the 1970s, when the Unix operating system was originally being developed, the designers created their own language, called C, to help make Unix easier to port to new computer systems. C was one of the first and, in retrospect, is arguably the most successful high-level language. The benefit of C over assembly language was two-fold. First, the programmer could write code once that would run on multiple computer systems. All she had to do was recompile the C code for the target system and it would, if written properly, run without modifications. The other benefit of C code is that it was a lot more readable and understandable to the programmer. Both of these benefits greatly simplified the programmer's job.

C is still in active use today, either directly or in one of its derivatives forms, such as C++ and Objective-C. C also brought with it the ability to put commonly used code into libraries. Code – such as displaying text to the user and receiving input to the user and manipulating strings – can be re-used by many programmers and applications. The benefit is that each developer can spend their time writing their own application instead of having to re-invent the wheel, so to speak. Reusing code through libraries is also a big boon for the programmer.

But as good as reusing code through libraries is, it does have limitations. Sometimes, different applications perform many common tasks that may not be codified into libraries. Or sometimes these common tasks transcend the particular language you are using and apply to, say, any object-oriented programming languages. These higher-level reusable tasks are called *design patterns*. Design patterns are not unique to software development. The term “pattern” as a reusable idea originated from an architect named Christopher Alexander.

Software design has some similarities to traditional architecture and engineering, and design patterns are one of these similarities. The term design pattern in the software industry was popularized by the seminal book *Design Patterns: Elements of Reusable Object-Oriented Software*. The book was written in 1995 by four authors: Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides – now infamously known as the “Gang of Four”. The Gang of Four (GoF) patterns book cataloged and described many design patterns that the authors used, or had observed in object-oriented applications. While the examples are in C++, the patterns themselves are still relevant to this day. In fact, there are now many books covering design patterns in specific languages, but the concepts are generally the same.

Aside from providing solutions to common software design problems, the benefit of using patterns is to create a common language and vocabulary that all programmers can use to help describe these problems. By providing a common vocabulary, anyone familiar with it will understand when someone says, for example, “this object implements the Adapter pattern to interface with the legacy database” or “you should use the Factory pattern to ensure future flexibility.” The GoF book describes the Adapter pattern and Factory pattern in detail.

Obviously design patterns are a large topic and not something that I could do justice to in a single magazine article. I highly recommend you pickup (or borrow) a copy of the GoF book and read it. Even though it may be a little dated and does not apply directly to Objective-C, it will provide you with knowledge that will benefit you for years to come.

The Model-View-Controller Design Pattern

One common design pattern for developing GUI applications called the *model-view-controller pattern* or *MVC pattern* for short. The MVC pattern, while not described directly in the GoF book, is an old pattern with roots in Smalltalk from the early 1980s. It has proven such a successful pattern that it is prominent not only in modern Mac OS X applications in Cocoa, but also in Ruby on Rails web applications, and now in native iPhone applications, as just a few examples.

The MVC pattern breaks objects in an application into three roles: model objects, view objects, and controller objects. Objects in each role serve a particular function, and a single object should not perform multiple roles. The idea is to reduce dependencies, or *coupling*, between the components of an application. This loose coupling promotes reusability of each of the individual components.

Apple chose the MVC pattern as the basis for all Cocoa applications based on the success of the MVC pattern in Smalltalk and lessons learned in classic Mac OS. Apple used this experience to make programming for Mac OS X as easy as possible. They created the classes in AppKit and Foundation based on this collective experience, and these classes are now available for your use.

The Model

Model classes and objects are the core of your application. Think of them as your application, without a user interface. If, for example, you were developing an address book application, you would probably have objects to represent each contact, as well as objects to represent groups of contacts. Often, model objects are saved to disk and loaded in future invocations. Again, for an address book application, you would want to store all the contacts and groups on disk somewhere, so they could be loaded when your application next runs.

Ideally, model classes are completely independent of the user interface. This allows these classes to be reused in other applications and with other user interfaces. For example, you could use the same classes in a GUI, command line, and iPhone application. Or, you may be writing automated unit tests to ensure that the model objects work as desired. The reason these objects can be used in so many different situations is because they have no ties to the user interface. In technical terms, the model objects are not coupled to the user interface.

In our previous applications, the `Rectangle` class would be considered a model object. In fact, we have already reused this class in multiple applications. We started out using it in a command line application, and then used the exact same class when we started writing GUI applications.

The View

View objects and classes are at the other end of the spectrum. They represent the user interface and display information to the user. However, they are not responsible for storing the data they display. For GUI applications, we've already seen a number of view classes. For example, `NSButton`, `NSTextField`, and `NSWindow` are view classes. The `NSApplication` class is also considered part of the view as it represents the hub of a GUI application. Again, the main purpose of making generic view classes is to make them reusable in many applications. You could say that much of the AppKit framework is comprised of view classes, and the fact that AppKit provides so many pre-made view classes is one reason why it is easy to develop GUI applications for Mac OS X.

By designing AppKit using the MVC pattern, Mac OS X applications get to stand on the shoulders of giants. As programmers, we get to build on Apple's wealth of experience creating and designing GUI applications.

The Controller

Controller objects sit between the model and view classes and shuffles data back and forth. The GoF book describes a Mediator pattern where an object works like a real-world mediator communicating between two separate parties. The controller objects often follow this Mediator pattern.

One of the controller's responsibilities is to keep the model and view in sync. Figure 1 shows how the models, views, and controllers interact with each other. You can see the user interaction from the view goes through the controller. This user interaction is often in the form of targets and actions. For example, when a user clicks a button, the action method is on a controller class. The controller class is responsible for taking data out of the view and updating the model class. Conversely, if the model object changes without user interaction, it notifies the controller. It then updates the view accordingly. The controllers also generally act as the delegate and data source for views.

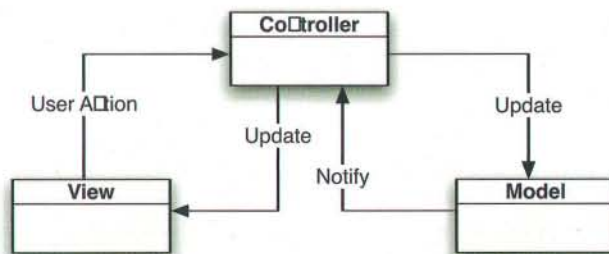


Figure 1: Model-View-Controller interaction

Hello World as MVC

Let's look at some of our programs through the MVC prism. The GUI from our original **HelloWorld** rectangle application is shown in Figure 2. The user interface is made up of standard Cocoa controls: a window, some text fields, and a button. These are all considered part of the view.

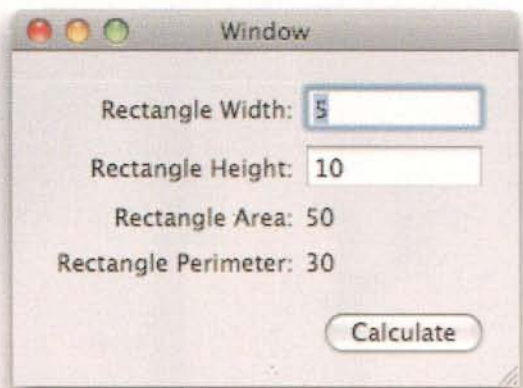


Figure 2: Rectangle application window

The rest of the application was implemented in two classes: **HelloWorldController** and **Rectangle**. As I mentioned above, the **Rectangle** class is considered a model class. The name I chose for **HelloWorldController** may not have made sense back then, as we didn't know about MVC, but it should be clear now. Since it performs the role of a controller class, I named it accordingly. Let's take a quick look at the interface for **HelloWorldController** in Listing 1.

Listing 1: HelloWorldController.h

```
#import <Cocoa/Cocoa.h>

@class Rectangle;

@interface HelloWorldController : NSObject
{
    IBOutlet NSTextField * _widthField;
    IBOutlet NSTextField * _heightField;
    IBOutlet NSTextField * _areaLabel;
    IBOutlet NSTextField * _perimeterLabel;

    Rectangle * _rectangle;
}

- (IBAction) calculate: (id) sender;

@end
```

This controller class has outlets to the text field, a **calculate:** action, and a **_rectangle** instance variable. Outlets and actions are generally how controllers and views are hooked up. Actions are used by views to notify the controller of a user's action. The controller uses outlets to get current values from the view and update the view to new values of the model.

When the button is clicked and the action method is performed, the controller updates the **_rectangle** instance variable from the width and height text fields, and finally it updates the area and perimeter text fields:

```
- (void) updateAreaAndPerimeter
{
    [_areaLabel setFloatValue: _rectangle.area];
    [_perimeterLabel setFloatValue: _rectangle.perimeter];
}

- (IBAction) calculate: (id) sender
{
    _rectangle.width = [_widthField floatValue];
    _rectangle.height = [_heightField floatValue];
    [self updateAreaAndPerimeter];
}
```

You can see even in this simple example how the model view controller works. Data flows from the view to the model and vice versa through the controller. The controller receives a user action and updates both the model and the view to keep them in sync.

Model-View-Controller in Cocoa

You are highly encouraged to follow the MVC design pattern when writing your own applications. If you do, you will find that the Cocoa environment will help you get your job done faster. Apart from providing a rich set of view classes, there are some other benefits to following MVC. Some of the more advanced Cocoa technologies rely on MVC: **Document Architecture** – Document-based applications follow the MVC pattern with your **NSDocument** subclass playing a controller role. When we changed our single window application to a document-based application that could save and open rectangle documents, we modified the **Rectangle** to implement the **NSCoding** protocol. By giving the **Rectangle** class the ability to convert itself to and from a sequence of bytes, it stays consistent with the role of a model class. However, it was the controller class that interacted with the view to perform the actual saving and loading to and from a file.

Cocoa Bindings – Bindings is a technique that allows you to remove a lot of repetitive code from your controller classes. This is an advanced technique that in turn relies on key value coding (KVC) and key value observing (KVO). We will cover these topics in due time.

Core Data – Core Data allows you to easily create complex model objects and save them to disk. This allows you to remove a lot of repetitive code from your model classes. Again, we will cover Core Data in a future article.

Conclusion

The Model-View-Controller design pattern was identified as a way to design GUI applications that promotes loose coupling and reusability of its components. Apple chose the MVC pattern as the foundation for AppKit based on its previous success in Smalltalk. Because of this, you should design your Mac OS X applications with the MVC pattern in mind. It ensures your code is as reusable as possible, which

is always a good thing, as you never know when you may need to use your model classes in another application. You will be glad you followed the MVC pattern when you do. As we will see in upcoming articles, Cocoa also rewards those following the MVC pattern.

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MI

About The Author



Dave Dribin has been writing professional software for over eleven years. After five years programming embedded C in the telecom industry and a brief stint riding the Internet bubble, he decided to venture out on his own. Since 2001, he has been providing independent consulting services, and in 2006, he founded Bit Maki, Inc. Find out more at <<http://www.bitmaki.com/>>

and <<http://www.dribin.org/dave/>>.

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BOOK REVIEW

by Edward Marczak

Take Control of Mac OS X Backups, Take Control of Easy Backup in Leopard

Two backup titles in the *Take Control of* series

Introduction

The *Take Control of* series of electronic books has become a staple for many computer users—typically those just beginning a particular topic. Two titles from Joe Kissell, “*Take Control of Mac OS X Backups*” and “*Take Control of Easy Backups in Leopard*” also fall into the beginner to mid-level category. That’s not a slight at the subject matter: Joe knows his audience and leads them through the topics at hand skillfully.

Take Control of Mac OS X Backups is the heftier, deeper work, suitable for single users with a fair amount of data to back up through people running a home or small-office LAN needing to backup multiple data sources. *Take Control of Easy Backups in Leopard*, as the title implies, is aimed more at the home user with one or two machines to independently back up and primarily focuses on deciding if Time Machine is the right tool for the job.

Both titles are released in print and as e-books, delivered as a PDF that you download. The e-books have the advantage of being Able to be updated as the author updates the material. It also makes it easy to search and carry with you.

Take Control of Mac OS X Backups

The first book in this review is the 178 page *Take Control of Mac OS X Backups*, version 2.1 (yes, as an e-book, it gets a version, and you’re entitled to updates). It’s the older and denser of the two titles, and consists of 7 core chapters with 5 appendices and a glossary. To quote the author in the early Readme chapter, “I’ve written this book primarily for people who need to back up either a single computer or a small network—not for system administrators who need to back up dozens or hundreds of machines.” That said, the first core chapter, “Decide on a Basic Backup Strategy” gives excellent advice to *anyone* getting into the details of backup. This chapter immediately dispels the myth that there’s any silver bullet for backup that takes planning and vigilance away from the administrator.

The first core chapter also quickly makes the reader aware of the various processes—and the differences between them—that are referred to as “back up:” duplicating, archiving

and synchronizing. From there, readers are put through the paces of identifying special situations: the photographer, the video or audio artist, etc. Each has special and different backup needs compared to someone that performs research and creates documents using a Word processor. Overall, readers are asked to *think* about their backup scenario and understand that it is unique. This chapter also contains sections on backing up while traveling and handling Windows files and partitions (for those of you Boot Camp users).

The next chapter, “Choose Your Hardware,” leads you through deciding on which medium—or mediums—you will use as your backup targets. As this version of the book was produced in mid-to-late 2007, I was surprised to see any mention of Iomega in the text at all (do our younger readers even know who Iomega is?). The remainder of the chapter is perfectly reasonable, helping users through the myriad of choices in this arena. These choices include flash drives, through hard drives up to remote storage options.

Hardware is useless without the software that will copy the data to those targets. The “Choose Your Software” chapter is another ‘thinking’ chapter in that it really makes you think about what’s important in a backup application for your situation. There are specific programs mentioned, but the emphasis is really on features to look for in backup software. The options listed range from do-it-yourself UNIX command line options, to old-guard standards like Retrospect up to newcomers like Crashplan. Software choices are paired with specific hardware options as described.

The final chapter before the appendices helps the reader put it all together. Configuring parts of the OS, configuring the backup targets and readying the software. One point I disagree with in this chapter is the advice to avoid File Vault. I’ve personally been using File Vault to protect my home directory for a long time and have never had an issue. Not to say that Mr. Kissell’s note that corruption can rend a File Vault archive unusable; that is true. More to the point, this is the perfect combination: when using File Vault, you need to have a backup plan! Perfect combination. Full disk encryption products hadn’t been announced at all at the time of version 2.1’s writing, however, there are now three products (one shipping

and two on the way) that will fully encrypt a boot drive on an Intel Mac, obviating the need for File Vault altogether. This will ultimately be the best bet, but for now, File Vault is a good option, but one should absolutely have a backup plan when using it. On a high point, the chapter does talk about media management and restoring just as much as backing up in the first place.

There's even more to the book, but I'll leave that for you to find. The book is well worth the \$15 purchase price, and Joe Kissell himself tells me that he's hard at work on updates that include up to date status on backing up in Leopard. Purchasing the e-book now allows you to update to new versions as they're released. Also, currently, purchasing this title also gives you *Take Control of Easy Backups in Leopard*. Find out more at the web site for the book: <http://www.takecontrolbooks.com/backup-macosx.html>.

Take Control of Easy Backups in Leopard

In appropriate contrast to Take Control of Backups in OS X, which addresses multiple machines and small network backups, *Take Control of Easy Backups in Leopard* is as simple the title would lead you to believe. This is the book you give to a switcher or someone entirely new to computers. It's intended for a home user who deals primarily with one machine and wants or needs a backup in place quickly and easily. Its roughly 78 pages are direct and useful. This review covers version 1.0 of the e-book title and I'm told Joe is hard at work on updates to this title, which owners will be entitled to download when available.

While similar in structure to Take Control of Backups in OS X, all of the options presented are simplified. For example, the book only deals with external hard disks as targets for backups. No tape, no LAN-based backup, and so on. This is entirely appropriate, of course.

Most importantly, like the other title in this group, *Take Control of Easy Backups in Leopard* makes the reader *think* about *their* set up. The "easy" tag in the title is not a substitute for 'sloppy' or 'corner-cutting.' Concepts like off-site backups and the importance of rotating backup media are discussed here, too.

From this point, the reader is guided through preparation of backup targets and a backup scheme. The bulk of the book then focuses on Time Machine as a backup program. Again, this is completely appropriate given the audience the title is targeted at ("easy," remember?). Other utilities are lightly touched on, followed by a chapter on restoring your backups for "When Disaster Strikes" (the title of the chapter on restoring).

This book alone comes in at \$10—just right for the audience it serves. Find out more at the page for the e-book at <http://www.takecontrolbooks.com/leopard-easy-backup.html>.

Conclusion

Both titles are a good value: the information is always practical, and the e-books are updated as new information comes to light (read: as Apple fixes bugs and updates their software and functionality changes). After having read either of these titles, a trepidatious new user will feel more comfortable, in control and knowledgeable. Although intended for beginners in the respective 'small' categories – small business network or home user with a single computer – I've met IT staff in larger organizations that could learn a thing or two about backup from Take Control of Backups in OS X. Most importantly, these titles make you *think* about backup in *your* specific situation. The Take Control web site offers sample chapters, so, if you're still not convinced, go download a sample and check it out for yourself.

MM



About The Author

Ed Marczak is the Executive Editor for MacTech Magazine, and has been lucky enough to have ridden the computing and technology wave from early on. From teletype computing to MVS to Netware to modern OS X, his interest was piqued. He has also been fortunate enough to come into contact with some of the best minds in the business. Ed spends his non-compute time with his wife and two daughters.

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Axiotron ModBook

The ModBook is the right solution... for some people

by Dennis Sellers

If you've been around the industry for a while, you undoubtedly have been asked about what Mac tablets are available. The ModBook from Axiotron (<http://www.axiotron.com>) will make those who need to plan and draw very, very happy. Especially those who diagram, or are in the graphic design, visual arts, architecture and similar fields. The world's only Mac tablet is a modified Apple MacBook — hence the name. In fact, when you buy one of the “tablet-ized” laptops it comes in the original box of the MacBook that's been modded.

The ModBook is an US\$2,290 or \$2,479 slate-style computer. It's a tablet device, but not a touchscreen product (more on that in a minute). The less expensive model sports a 2.1GHz Core Duo processor, 1GB of RAM, a CDRW/DVD-ROM Combo Drive and a 120GB hard drive. The higher end ModBook touts a 2.4GHz Core Duo processor, 2GB of RAM, a double-layer SuperDrive and a 160GB hard drive. Performance specs are the same as those of the MacBook on which the ModBook is based.

Both models retain all the ports and features of the Apple laptop, including the iSight webcam. However, the folks at Axiotron have added Wacom Pen-enabled hardware for pen input and have equipped the tablet computer to work with Apple's Inkwell, a Mac OS X 10.4 feature that provides system level handwriting and gesture recognition to several Mac applications.

They've also added a built-in Global Positioning System (GPS). To many, this may seem more of a gimmick than a useful feature since the ModBook is very hefty for a GPS device, but for others, they will be glad it's there. Thankfully, you can turn GPS off to spare the battery.

With all the extra goodies, the ModBook is slightly deeper and heavier (1.16 inches and 5.5 pounds) than an unmodified MacBook (1.08 inches, five pounds). Most of the extra heft is due to the dual-layer magnesium frame, triple-layer plated magnesium top shell and ForceGlass screen cover. These bulk up the tablet computer a bit, but it also makes it very rugged and durable.

If you like your current laptop, you probably won't go for the ModBook. As Axiotron has removed the keyboard and mouse. Of course, you can attach such peripherals via the USB ports, but that defeats part of the concept of the ModBook. It all comes down to whether you are using the ModBook as a tablet computer, or because you like having the Wacom hardware and the MacBook so closely integrated.

Also, if you want a tablet computer that sports a touch screen a la the iPhone and latest Apple laptops, the ModBook is not for you. All input requires you to use the styluses that come with the device or an onscreen keyboard (dubbed “QuickClicks”). Axiotron says the ModBook doesn't respond to hand/finger touch “for the reason that it's made for artists and design professionals whose work would be

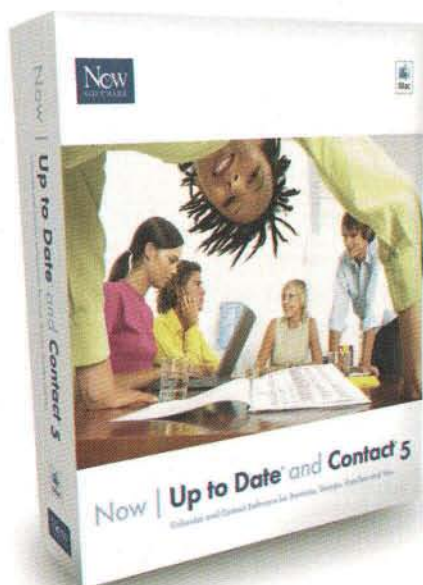


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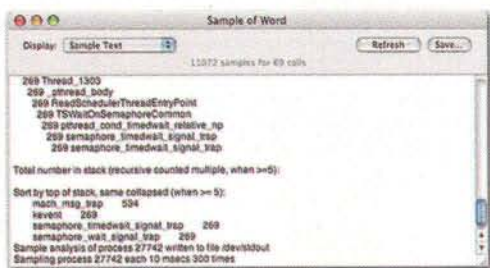


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inhibited using a touchscreen device since their hands rest up on the device as they draw or design."

These features make the ModBook a less likely solution for the general end user, students and office workers ... unless they are the type of user that diagrams or draws things. For a user whose primary task is entering text, writing, email and surfing the web, a traditional laptop is much easier to use with a physical keyboard. As for gamers, well, the ModBook is not for you.

However, creative professionals, those that diagram, and users in the fields I mentioned in the first paragraph should give Axiotron's tablet Mac a look. The big draw (pun intended): with it, you can draw and write directly on the screen.

The stylus and touchscreen, utilizing Wacom technology, offer 512 levels of pressure sensitivity. On one hand, Wacom's Intuos tablet has 1,024 levels of sensitivity and costs about a third of what the ModBook costs. But after you've gotten used to the ModBook, there's something that feels natural about drawing and writing directly on the screen of the device. And it works great with software such as Photoshop and Corel Painter.

The Modbook will appeal to others beyond traditional designers. For example, an architect could carry the tablet to a job site, look up plans and view them in 3D applications. Revision notes could be drawn on-screen and quick pics taken with the iSight (though aiming the camera would be a bit tricky).

Real estate agents and insurance adjusters could use the ModBook to collect signatures and look up info easily. Ditto health care professionals, who could use the device for quickly viewing a patient's chart and making quick notes. It's also great for diagramming (for example, a network administration drawing network diagrams), jotting down notes during brainstorming sessions and helping project managers juggle projects.

For what it is, Modbook is a great device. If you're one of the previously mentioned type of potential users, the "world's only Mac tablet" should be added to your arsenal. It's worth the money for anyone who has to constantly draw or (hand) write on screen. But for most of us the ModBook would simply be an expensive novelty item.

Also note that there's no Apple warranty for the ModBook. You have to get it serviced (under its own one-year warranty) through an Axiotron authorized dealer, not in Apple Stores.

MH

About The Author

Dennis Sellers is a long time journalist. He started in the newspaper business, but has been in the online journalism business for the past 15 years. He's the editor/publisher of Macsimum News (<http://www.macsimumnews.com>)

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THE MACTECH SPOTLIGHT

Andy Lee

<http://notesfromandy.com>

What do you do?

I'm a Java programmer for Pando Networks in New York City. Pando is a peer-to-peer platform for commercial video streaming. We also have a consumer app for easy file sharing. You might guess that I work on our Mac application, but actually I don't; I work on back-end business logic and some database stuff. I do Cocoa programming in my spare time, often at a coffee shop or restaurant while waiting for my laundry.

How long have you been doing what you do?

I've been a programmer since 1978, when my uncle got me my first job, as a summer hire at Exxon R&D in New Jersey. I was a junior in high school. They challenged me to find a way to manipulate a cursor in two dimensions on the screen of an Apple II. I managed to write a primitive diagram editor, using two game paddles to move crosshairs. I wasn't smart enough to invent scrolling; I used the keyboard to paginate. And at the time I didn't understand what a file was, so I had no way to save documents.

What was your first computer:

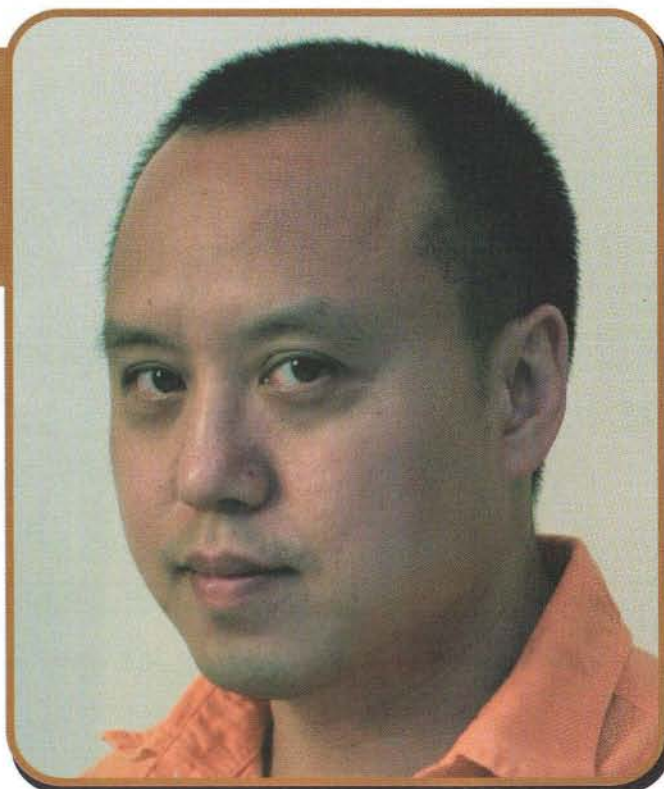
My first computer was a Compaq portable, back when they had 9-inch monochrome screens and 5 1/4" floppies, and weighed thirty pounds. I think my first Mac was a Mac Plus, or maybe one of the 512 models. My first Cocoa development machine was a NeXT cube.

What is the advice you'd give to someone trying to get into this line of work today?

Assuming you've already got a technical background, I'd say read everything you can find by Joel Spolsky. Then read everything he tells you to read.

What's the coolest tech thing you've done using OS X?

That would be AppKiDo. Not because there's any rocket science in it. In fact, frankly, there's some dumb stuff in there. One thing I'm proud of is that it was the first app of its kind that was designed to navigate the APIs conceptually — for example, with a class browser, and with "quicklists" of logically related classes — instead of merely following the directory structure of the documentation. The most gratifying thing is when someone tells me my app helped them learn Cocoa, because I had beginners as well as experts squarely in mind when I designed it.



As proud as I am, I know the app is overdue for some improvements. I'm working on it.

Where can we see a sample of your work?

The binary and source for AppKiDo are at <http://homepage.mac.com/aglee/downloads/appkido.html>.

The next way I'm going to impact IT/OS X/the Mac universe is:

First I have to add the iPhone docs to AppKiDo. There's a whole new generation of beginners to help! Beyond that, my contributions to the Mac universe will come in the form of scratching my personal itches. I have ideas for the Mac equivalent of the Great American Novel, and a couple of Great American Short Stories. I haven't blogged about Cocoa per se, but there are a couple of topics I'd like to offer my take on, like retain-based memory management and the way it is typically explained. I'd like to be more helpful to the NYC CocoaHeads group; I always feel personally responsible when it takes us forever to figure out where we're going for burgers and beer.

I'd like to thank Hoshi Takanori for writing Cocoa Browser, which was tremendously useful to me in the early days, and I'd like to say that the Apple documentation team does a ton of great work that is often underappreciated.

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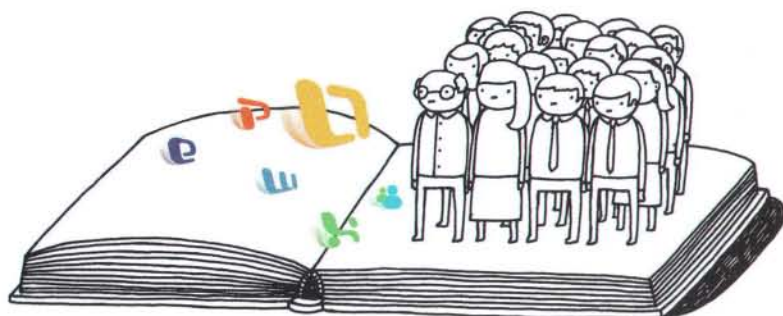
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